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FINAL
CORRECTIVE MEASURES STUDY INTERIM REPORT - GROUNDWATER CORRECTIVE MEASURES OBJECTIVES

GE Aviation – Evendale Facility
Evendale, Hamilton County, Ohio

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Corrective Measures Study Interim Report – Groundwater Corrective Measures Objectives

GE Aviation – Evendale Facility
Evendale, Hamilton County, Ohio

Prepared for: GE Aviation

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EXECUTIVE SUMMARY

This Groundwater Corrective Measures Objectives (CMOs) Interim Report summarizes the groundwater exposure pathway evaluation, the development of groundwater CMOs, and the strategy to address impacted groundwater. This strategy is based on the following understandings:

- The selected Corrective Measures Alternative will protect potential receptors at potential exposure points as a short-term goal, with the longer-term goal of Maximum Contaminant Level (MCL) attainment and return of groundwater to maximum beneficial use.
- GE has a groundwater Interim Remedial Measure (IRM) (strategic pumping and natural attenuation) in place and operating, resulting in a stable plume, with groundwater pumping and Monitored Natural Attenuation (MNA) achieving the short-term cleanup goal of protectiveness.
- The pump and treat (P&T) program, operating since 2011, and MNA program have decreased chlorinated volatile organic compound (CVOC) concentrations in groundwater by as much as two orders of magnitude.
- The IRM is reaching a point where the remediation technology at some locations can be transitioned from P&T to MNA.
- The CMOs include concentration objectives and performance monitoring locations that have been developed to support the evaluation of relevant corrective measure alternatives. The CMOs can also be used to guide the transition from active pumping to MNA.

Identification of Constituents of Potential Concern (COPCs) and Key CVOCs – A comparison of perimeter and off-site groundwater data with USEPA Tapwater Risk Screening Levels (RSLs) and MCLs identified groundwater COPCs with concentrations above screening levels. COPCs that were detected in both on-site and off-site wells consist of benzene, chloroform, trichloroethene (TCE), 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethane (1,2-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride (VC). 1,1,2-trichloroethane and 1,2-dibromomethane were detected only in off-site monitoring wells, and including 1,2-DCA, are primarily related to the nearby Pristine Superfund Site and represent impacts to off-site or regional groundwater quality. Constituents such as benzene, chloroform, tetrachloroethene, trans-1,2-dichloroethene, and methylene chloride, when detected in on-site perimeter monitoring wells, were detected at concentrations near or below MCLs. As a result, groundwater CMO development focused on seven key CVOCs consisting of TCE, 1,1,1-trichloroethane (1,1,1-TCA), and their daughter or breakdown products which represent a subset of the highest priority COPCs needed to effectively manage exposure and risk.

CSM Development – A human health and ecological conceptual site model (CSM) was developed to identify the relationship between chemical sources and the current and future potential receptors. The CSM was used to assist in identifying potentially complete exposure pathways under current and reasonably anticipated future land use.

Groundwater Exposure Pathway Analysis – Potential on-site receptors evaluated to support the development of preliminary groundwater cleanup goals included office workers, indoor/outdoor industrial workers, construction workers, utility workers, and trespassers. Potential off-site receptors included residents. Recreational users and ecological receptors were also evaluated with respect to discharge of shallow groundwater to Mill Creek. Key findings include:

- On-site groundwater direct exposure pathways are considered incomplete. Groundwater beneath the Facility is not currently used, and will be restricted from future use by an environmental covenant and implementation of an Institutional & Engineering Controls (I&EC) Plan.
- The pathway related to vapor emissions from shallow groundwater into worker-occupied buildings is being addressed separately and hence is not addressed in this interim report.
- Groundwater from the Facility migrates in the southerly direction, may migrate toward the Wyoming well field, and could potentially be used in future by off-site residents for agricultural, industrial, or potable purposes. Off-site groundwater is a current source of drinking water (*e.g.*, Lower Sand and Gravel [LSG]) or a potential future source of drinking water (*e.g.*, Perched zone and Uppers Sand and Gravel [USG]). The City of Wyoming

is the only nearby downgradient municipality to operate a well field and currently treats the groundwater for VOCs as a precaution prior to distribution. With the exception of the City of Wyoming, no potable uses of groundwater have been identified within two miles south of the Facility. The nearby population depends on the public water system for drinking water. The history and nature of industrial activity in this area of the Mill Creek valley has resulted in multiple off-site potential sources that degraded ambient groundwater quality in the Mill Creek Basin. The potential for future exposure to off-site residents via the drinking water pathway was the first of two pathways considered in the development of groundwater CMOs at the Facility boundary.

- Discharge of impacted shallow groundwater (*i.e.*, Perched zone) to surface water/sediment of the nearby Mill Creek was also considered as an additional potential exposure pathway. The primary route of potential human exposure is incidental ingestion of surface water. Exposure via dermal contact, ambient inhalation, and fish consumption is considered de minimis. The Mill Creek is not designated as a public water supply and use as a recreational watershed is minimal. Ecological exposure routes include direct contact with Mill Creek surface water and sediment by benthic invertebrates and fish, and ingestion of surface water and incidental ingestion of sediment by wildlife receptors. The surface water pathway, including minimal recreational use and relatively poor water quality due to urban runoff and industrial/municipal discharge, was the second of two pathways considered in the development of groundwater CMOs at the Facility boundary.

CMO Development – CMOs were developed to guide technology selection and support performance monitoring of the Final Corrective Measure. The CMOs include on-site concentration objectives at the downgradient property boundary that are protective of potential receptors at the potential off-site exposure points: Wyoming Well Field (to southwest) and Mill Creek (to southeast). The concentration objectives were derived from analytical modeling of solute fate and transport.

OBG used the BIOCHLOR modeling package (Aziz *et al.*, 2002) to perform back-calculation of chlorinated volatile organic compound (CVOC) fate and transport from the potential exposure points of Wyoming Well Field and Mill Creek, upgradient toward the Facility boundary. The modeled scenarios assumed that the primary drinking water standards (USEPA MCLs) and surface water quality criteria should be applied for the theoretical potential receptors. Model calibration considered published and previously measured rates of biodegradation, sorption, dispersion, and advection (OBG, 2009; 2010a). The calibrated model achieved a good correlation with sampling results at on-site and off-site wells. Multiple simulations of solute fate and transport were performed to evaluate the sensitivity and range of key parameters. Source concentrations, biodegradation rates, and travel distance were identified as the modeling variables with greatest influence on results.

The back-calculation process utilized the calibrated model to evaluate site perimeter concentrations that would be protective of water quality at the potential exposure points (Wyoming Well Field and Mill Creek). Back calculation relied on the calibrated model, a reduced (by 50%) biodegradation rate, and several other conservative, simplifying assumptions. The back-calculation results were used to develop the proposed CMOs at the downgradient property boundary.

Recent groundwater concentrations at key perimeter monitoring wells completed in the Perched zone, USG, and LSG are generally at or below the proposed CMOs. Active pumping at the southwestern portion of the Facility, at extraction wells EW-7S and EW-8D, may be evaluated for transition to MNA.

Remedial Time Frames – CMOs are estimated to be attained over the next approximately 3-5 years based on current IRM performance monitoring results. In contrast, the remedial time frame to achieve the long-term groundwater cleanup goal of MCLs is estimated to be greater than 30 years due to the presence of highly heterogeneous subsurface conditions, CVOC-impacted fine-grained materials at depths of 60 feet or more, and back-diffusion of CVOCs from residual sources in less-permeable strata. Groundwater will continue to be monitored after CMO attainment to document progress toward cleanup goal attainment. Other conditions will also be monitored to document that there continues to be no unacceptable exposure to the long-term presence of low CVOC concentrations in groundwater. These conditions include:

- Groundwater at the Facility is not used for potable or industrial purposes and usage will be restricted by an environmental covenant.

- The groundwater IRM has reduced CVOC concentrations in groundwater by orders of magnitude and continues to be protective of potential receptors at the Wyoming Well Field and Mill Creek. The City of Wyoming air stripper provides an extra level of protectiveness for the groundwater pathway.
- Theoretically, off-site groundwater may be considered to be a potential source of drinking water. However, with the exception of the Wyoming well field, no actual potable uses of groundwater have been identified within 2 miles south (downgradient) of the Facility. In addition, due to the availability of a safe and reliable municipal drinking water supply, and the broad occurrence of degraded ambient groundwater quality associated with a long history of manufacturing at multiple properties, off-site groundwater is unlikely to be used for drinking water purposes in the foreseeable future.
- State and county requirements exist for the permitting, sampling, and abandonment of private water wells. GE will provide the Hamilton County Public Health Division of Water Quality with a map of potentially affected groundwater so they can control well installation permit applications based on current conditions in the affected areas. In addition, GE will conduct annual reviews of well permits and water supply records in the plume area to confirm that there are no additional potable users of groundwater. A report on the results of this review will be submitted to USEPA annually.

Technology Selection and Performance Monitoring – During the previous (circa 2008) screening and selection of IRM technologies, GE considered the universe of applicable technologies and, with USEPA consent, selected P&T as the most appropriate form of active remediation. In the Corrective Measures Study (CMS), GE will build upon this previous screening by reviewing new technologies since the IRM screening, to confirm that P&T and MNA continue to be the most applicable and effective technologies to achieve the CMOs and long term cleanup goals.

GE also outlined a process for evaluating CMO attainment and for follow-on decisions about technology transition from combined P&T and MNA technologies to MNA only. The process is described using the Data Quality Objective (DQO) decision-making approach employed in the IRM Performance Monitoring Plan (PMP, OBG 2010). Highlights of the process include:

- CMO attainment will be monitored by influent sampling results from each extraction well and sampling results from nearby perimeter monitoring wells.
- Evaluate the transition from P&T to MNA for individual pumping wells, to be proposed to USEPA if CMO attainment is confirmed.
- After shutdown of individual extraction wells, concentration rebound will be monitored at the extraction well and surrounding monitoring points to verify that conditions remain compatible with MNA.

1.0 INTRODUCTION

This Interim Report summarizes the groundwater exposure pathway evaluation and the approach for development of groundwater corrective measures objectives (CMOs) for the GE Aviation facility (Facility) located in Evendale, Ohio (Figure 1). This document was prepared in accordance with the USEPA-approved Corrective Measures Study (CMS) Work Plan (OBG, 2014a).

As highlighted in the CMS Work Plan, the approach to addressing impacted groundwater is founded on several important understandings:

- The Facility is a secure, highly active, long-term manufacturing facility. An environmental covenant will be recorded to specify certain engineering and institutional controls. These controls will prevent unacceptable exposure to constituents of potential concern (COPCs) in the soil and groundwater within the boundaries of the Facility.
- Due to site controls and security at the Facility, the soil pathway has generally been under control since completion of the RCRA Facility Investigation (RFI) in the early 1990s. As a result, the groundwater pathway has been the primary focus of the Corrective Action Program over the last 15 years.
- The groundwater Interim Remedial Measure (IRM) of strategic pumping and natural attenuation has stabilized the groundwater plume(s) and has achieved protectiveness of human health and the environment under current conditions. The IRM is reaching a point where the remediation program can be gradually transitioned from P&T to MNA. Groundwater CMOs are being developed as performance criteria to guide this transition.
- Remediation of chlorinated volatile organic compounds (CVOCs) in groundwater to drinking water standards is not technically practicable within a reasonable time frame. Active groundwater remediation is being performed to control elevated concentrations and to prevent unacceptable exposure to potential receptors.
- The Facility is located in an industrial area with multiple known and potential off-site sources. CVOCs have been detected in groundwater at upgradient, sidegradient, and deep locations. These data suggest sources from off-site.
- The highest detections of CVOCs in groundwater are at the southern portion of the Facility, in the former U.S. Air Force (USAF) Plant 36 (former AFP36) property. These detections are being addressed by a groundwater IRM, consisting of strategic pumping and natural attenuation. Pending the findings of the CMS, it is anticipated that the final remedy will likely consist of the current groundwater IRM, with an eventual transition from P&T to MNA.
- Elevated detections of shallow soil gas concentrations are limited to the area near the IRM at the southeast portion of the site. Groundwater as a potential source of soil vapor is being addressed by the groundwater IRM and the current vapor monitoring program. The on-site vapor pathway for buildings in the central area of the Facility is being evaluated and will be documented separately.

These elements are further discussed in the relevant section(s) of this Interim Report.

1.1 BACKGROUND

The GE Aviation facility is located on an approximately 400-acre site in southwestern Ohio's Hamilton County, approximately ten miles north of Cincinnati. The Facility is a secure, highly active, long-term manufacturing facility located within the heavily industrialized I-75 corridor between Cincinnati and Evendale, Ohio. The Facility has been used for military and commercial aircraft engine manufacturing since the 1940s. Additional background information related to previous investigations and results related to impacted groundwater is presented in Section 2.

1.1.1 SWMUs/AOCs and Impacted Environmental Media

Based on the USEPA's 1989 Facility-wide Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA, USEPA 1989), there were 135 solid waste management units (SWMUs) and 20 areas of concern (AOCs)

identified at the Facility. As described in the approved CMS Work Plan, there are approximately 50 SWMUs/AOCs that were retained for further evaluation. The list of SWMUs/AOCs identified for further evaluation is summarized in Table 1. The CMS will build on the understandings of the RFI Report (OBG, 1995), taking into consideration (1) additional data collected since RFI Report approval (circa 1995), (2) current USEPA RCRA strategy and updates to Regional Screening Levels (RSLs), and (3) current site use, security measures and other controls in place at the Facility.

Impacted environmental media associated with the remaining SWMUs/AOCs at the Facility include soil, soil vapor, and groundwater. As discussed in later sections of this document, the key CVOCs found in groundwater consist of trichloroethylene (TCE), 1,1,1-trichloroethane (1,1,1-TCA), and their daughter or breakdown products.

1.2 OBJECTIVE

The objective of this Groundwater CMO Interim Report (Interim Report) is to identify, based on conservative assumptions, preliminary groundwater corrective measure objectives that are protective of on-site and off-site potential receptors within the study area[1].

1.2.1 Technical Approach

The technical approach to meet the objective for this Interim Report is as follows:

- Identify the primary COPCs
- Identify and evaluate migration pathways, potential exposure routes and potential receptors
- Calculate concentration objectives to guide the eventual transition of remediation technologies from P&T to MNA
- Identify performance monitoring locations
- Evaluate and propose remedial time frame(s).

The results from this groundwater CMO analysis presented in this Interim Report will be used to develop a practical approach to groundwater cleanup, taking into account technical limitations and natural attenuation processes.

[1] The study area is considered to be the area of chlorinated volatile organic compounds (CVOCs) related to the Facility, including the immediately surrounding area and downgradient plume(s).

2.0 GROUNDWATER CONDITIONS

A brief discussion of Facility background information, including site layout, surrounding property use, and previous investigations relevant to groundwater conditions is presented in the following sections. Additional information is included in the Conceptual Site Model provided in Appendix A of the CMS Work Plan (OBG, 2014a).

2.1 SITE LOCATION AND DESCRIPTION

The GE Aviation facility is located in southwestern Ohio's Hamilton County. The Facility is situated in the Mill Creek Valley between the East and West Forks of the Mill Creek and generally bordered by Interstate 75 to the west, the Mill Creek and CSX-Norfolk Southern railroad tracks to the east and southeast, Glendale-Milford Road to the north, and Shepherd Lane to the south (Figure 1).

The GE Aviation manufacturing plant in Evendale was originally established as a World War II aircraft engine production plant in the 1940's by Wright Aeronautical and was occupied by General Electric beginning in 1948. GE acquired a major portion of the plant in 1958. GE began operations as a manufacturer of military aircraft engines, but later expanded to the manufacture of commercial engines beginning in the early 1960's. In 1989, GE acquired the adjacent Ford Motor Company warehouse (north end of current Facility) and the 66.4-acre USAF former AFP36 complex (south end of current Facility)(Figure 1). This AFP36 area was used to support and supplement the activities of the adjacent GE-owned property.

The Interstate 75 corridor between Cincinnati and Evendale is heavily industrialized. Property use in the area surrounding the Facility includes heavy industrial and general industrial areas to the east, an independent trucking operation to the north, public facilities and general commercial and industrial areas to the south. Industrial properties located northeast to southeast of the Facility include Formica, Barrett (Cavett) asphalt plant, Dow/Rohm & Haas chemical (former Morton, Carstab), Cincinnati Drum Recycling, the City of Reading former municipal landfill, incinerator, and ash fields, and the Pristine Superfund Site. In addition, the former DuPont Lockland Works industrial development was located to the west of the Facility (Figure 1). Chlorinated solvent usage, storage, or disposal is known or suspected to have occurred at several of the above-listed industrial/ commercial properties as discussed in the CMS Work Plan. Residential properties of the City of Reading are located to the southeast, the Village of Evendale to the east, and the Village of Lincoln Heights, City of Wyoming, and Village of Lockland to the west/southwest of the Facility.

2.2 PHYSICAL SETTING AND SUBSURFACE CONDITIONS

The Facility is located in the Till Plains section of the Central Lowland Province of Ohio, a broad plateau which has been dissected by a number of large valleys. Mill Creek Valley, which trends north-northeast to south-southwest, is one of these dissecting valleys. Locally, the valley is drained by the East and West Forks of Mill Creek, the confluence of which lies approximately 1.5 miles south of the Facility.

Subsurface conditions beneath the Facility and surrounding area consist of a bedrock valley filled with 90 to 200 feet of poorly-graded permeable outwash sand and gravel interbedded with layers of silt, clay, and glacial till (Spieker, 1961; Fidler, 1970). The subsurface at the Facility is characterized as follows:

- The stratigraphy underlying the study area consists of five major sedimentary facies:
  - Perched zone – groundwater flow is south-southeast
  - Upper Confining Layer[2] (discontinuous silt and clay unit)
  - Upper Sand and Gravel (USG) – groundwater flow predominately southwest with a southeast component
  - Lower Confining Layer[2] (discontinuous silt and clay unit)

[2] Areas of thin to non-existent confining layers, referred to as communication zones, occur within the Upper and Lower Confining Layers (see Appendix A of the CMS Work Plan)

  - Lower Sand and Gravel (LSG) – groundwater flow is south-southwest.

- Significant flow zones include the semi-confined lower or deep zone (*i.e.*, LSG) and an upper or shallow zone which includes clays and silts of variable extent and thickness, further subdivided into the USG and the Perched zone. The sand and gravel deposits within the Perched zone are limited in extent and are generally not considered an aquifer for potable use. The USG is thin and areally limited as compared to the LSG and therefore provides lower yields to wells, as compared to the LSG.
- Seven key chlorinated aliphatic hydrocarbons, referred to herein as key CVOCs, found in groundwater consist of TCE and its daughter products cis- and trans-1,2-dichloroethene (cis/trans-1,2-DCE); 1,1-dichloroethene (1,1-DCE); vinyl chloride (VC); and 1,1,1-trichloroethane (1,1,1-TCA) and its daughter product 1,1-dichloroethane (1,1-DCA). The compound 1,1-DCE is also a daughter product of 1,1,1-TCA (via abiotic degradation).
- A comparison of the molar ratios of ethenes versus ethanes at select locations from the three water-bearing units indicates potential off-site source(s) and/or the occurrence of a mixed or co-mingled plume. The occurrence of multiple off-site groundwater plumes is supported by regional studies by the U.S. Geological Survey (Schalk and Darner, 2004).
- Observations of groundwater conditions favorable to anaerobic degradation of CVOCs and of degradation products, such as cis-1,2-DCE, VC, and 1,1-DCA, suggest that the TCE and 1,1,1-TCA are undergoing natural attenuation via mechanisms such as biodegradation, dispersion, and sorption. Intrinsic biodegradation is occurring in the three water-bearing units (Perched zone, USG, and LSG), and together with other natural attenuation mechanisms, is affecting the overall limits of the groundwater CVOC plume.
- The overall extent of impacted groundwater in the Perched zone, USG, and LSG is stable or decreasing, as evidenced by stable or decreasing: 1) total mass of the plumes, 2) center of mass of the plumes and 3) CVOC concentrations in most individual wells.

Historically, nearly all of the groundwater pumped in the Mill Creek Valley has been from the LSG, being used for industrial and municipal purposes, with residential use comparatively insignificant (Fidler, 1970; Schalk and Schumann, 2002). The City of Wyoming continues to operate a well field that pumps approximately 1 million gallons per day (mgd), located approximately one mile to the southwest of the Facility. VC has been detected at certain wells of the Wyoming well field at low concentrations (4 ppb or less), but not detected in the treated water supply. Monthly sampling of the Wyoming Wells for VOC analysis was conducted by GE, beginning in September 2007 and continued until November 2010. Although VC has not been detected in the treated groundwater supply, GE worked with the City of Wyoming Water Department and Ohio EPA in the design and construction of a supplemental air stripping unit as a precaution to remove VOCs that may be present in the raw groundwater. In 2011, the air stripper became operational, providing an extra layer of protection for the removal of potential VOCs before the treated drinking water is discharged to the water distribution system (City of Wyoming, 2010).

2.3 SUMMARY OF PREVIOUS INVESTIGATIONS

Several investigations of soil and groundwater conditions at the Facility have been completed (Geraghty & Miller, 1988; Geraghty & Miller, 1989), including implementation of a RCRA Facility Investigation (RFI) (OBG, 1995). In 1985, the USAF initiated a concurrent environmental assessment and characterization of the former AFP36 property (Figure 1), conducted under the USAF Installation Restoration Program (IRP). The assessments included a number of investigations to identify source areas and associated environment impacts (Engineering-Science, 1985; Chem-Nuclear Geotech, 1993; Earth Tech, 1997; Earth Tech 2003; and Earth Tech, 2004). In addition, OBG completed a treatability study, evaluation of IRM alternatives, source area investigation, aquifer performance testing, groundwater sampling and conceptual site model updates between 2006 and 2008.

As a result of investigative activities by GE Aviation, the focus of environmental investigations shifted toward developing a better understanding of the nature and extent of COPCs in the subsurface beneath the Facility and the groundwater migrating off-site from the southern end of the Facility.

2.3.1 Interim Measures

In the early 1990s, several IRMs were undertaken to assess the need for, or to initiate, remedial measures for selected areas identified by GE, USAF and the USEPA. Two of these IRMs included the implementation of groundwater pumping and treatment in product release areas or for containment purposes (see CMS Work Plan, OBG, 2014a).

In 2009, a groundwater IRM was initiated to address off-site migration of CVOCs in the southern (downgradient) portion of the Facility within the area of former AFP36 (OBG, 2009). The groundwater IRM objective is to mitigate migration of COPCs, while minimizing the risk of cross-contamination and/or reducing the effectiveness of biodegradation processes. The groundwater IRM consists of seven groundwater extraction wells and a groundwater treatment plant (GWTP). Operation of the GWTP was started on July 11, 2011, following construction and commissioning of the system. Groundwater monitoring activities, including baseline monitoring, have been conducted since startup in accordance with the approach and methods outlined in the *IRM Performance Monitoring Plan* (PMP, OBG 2010b).

2.3.2 Impacted Environmental Media - Groundwater

Groundwater conditions have been investigated since 1988, including routine RCRA groundwater monitoring, off-site investigations, and focused performance monitoring of the groundwater IRM since its startup in 2011. As discussed below, the overall extent of impacted groundwater in the Perched zone, USG, and LSG is stable or decreasing. A review of groundwater concentrations of CVOCs since 2007 for these water-bearing units indicates:

- ***Perched Zone*** - isoconcentration maps for the Perched zone for 2009, 2011 and 2013 submitted to USEPA (OBG, 2014b) indicate an overall decreasing extent of the Perched zone plume(s), especially downgradient of the Perched zone extraction wells. Concentrations along the downgradient portion of the Perched zone dropped from highs of over 1,700 µg/L total CVOCs to 577 µg/L.
- ***Upper Sand and Gravel*** - concentrations along the eastern portion of the USG plume(s) have dropped from highs of over 3,700 µg/L total CVOCs to approximately 1,400 µg/L. The overall size of the USG plume(s) along the western portion of the Facility has remained stable, with concentrations decreasing from highs of over 500 µg/L total CVOCs to less than 50 µg/L.
- ***Lower Sand and Gravel*** - concentrations within the LSG plume(s) have dropped from highs of over 1,500 µg/L total CVOCs to generally less than 500 µg/L, and most of the LSG wells have decreasing trends. The only apparent exceptions to this trend are observed at wells OSMW-8D and OSMW-6D, where VC concentrations have increased due to degradation of the key CVOCs. Despite these two exceptions, the overall size and mass of the LSG plume(s) has decreased. It is believed that the trends in OSMW-6D and OSMW-8D are, at least in part, indicative of diminished ambient groundwater quality in the study area due to potential off-site source(s) and/or the occurrence of co-mingled plumes.

Since startup on July 11, 2011, the IRM groundwater extraction system (GWES) continues to operate and the groundwater is monitored in accordance with the USEPA-approved PMP. The IRM performance monitoring includes influent and effluent concentrations as well as groundwater quality and hydraulic (water level) monitoring. A summary of groundwater performance monitoring results since initiation of the groundwater IRM was provided in a June 2015 CMS Interim Report (OBG, 2015a). A review of water quality data for the IRM extraction wells indicates steady-state or decreasing concentrations of CVOCs, with fluctuations associated with plume movement within the capture zone. Monitoring well hydraulic and chemical data do not indicate significant trends in vertical hydraulic gradients or VOC concentrations that are indicative of cross-contamination. Groundwater will continue to be monitored to evaluate the effectiveness of the IRM to mitigate off-site migration of COPCs. Natural attenuation of CVOCs in groundwater will also continue to be monitored for its potential to mitigate off-site concentrations of dissolved COPCs.

Additional details on addressing groundwater and the development of preliminary groundwater cleanup objectives are presented in Section 4.

3.0 SHORT- AND LONG-TERM CLEANUP GOALS

In order to implement corrective action in a protective, efficient and cost-effective manner, both short-term and long-term cleanup goals will be considered. Development of cleanup goals for this Facility will be guided by the following threshold criteria of the RCRA Corrective Action Program (USEPA, 1996; 2004):

- Protect human health and the environment
- Achieve media-specific cleanup objectives
- Control the source(s) of release so as to reduce or eliminate, to the extent practicable, further releases of hazardous waste or hazardous constituents that may pose a threat to human health and the environment

In addition to consideration of these threshold criteria, USEPA goals for corrective action include returning impacted groundwater to its maximum beneficial use (USEPA, 1996; 2004). Development of media-specific cleanup objectives (referred to herein as CMOs) is discussed in detail in Section 4. The development of CMOs considers technical impracticability of source area cleanup and an approach that allows transition from the groundwater IRM to a final groundwater remedy.

3.1 SHORT-TERM PROTECTION GOAL

USEPA has developed Environmental Indicators (EI) to monitor the progress toward achieving a short-term protection goal that focuses on demonstrating that the groundwater plume is under control (*i.e.,* stable or shrinking plume). An analysis of IRM groundwater performance monitoring data, statistical trends of plume size and mass, and time series isoconcentration maps indicates the groundwater plume(s) in the three water-bearing units to be stable or decreasing based on data obtained since 2008. GE believes the current situation is protective (based on the exposure pathway analysis presented in Section 4) and the short-term protection goal has been achieved through the groundwater IRM (strategic pumping and natural attenuation). The Groundwater EI (CA750) short-term protection goal will be used as the starting point in development of CMOs for the Facility.

3.2 LONG-TERM CLEANUP GOALS

USEPA recommends the three threshold criteria (*i.e.*, protect human health and environment, achieve media cleanup objectives, and source control) be used as general goals for final cleanup and for screening potential corrective measures (USEPA, 2004). The long-term cleanup goals for the Facility will incorporate the following concepts:

- Use of a risk-based approach in developing cleanup levels and approaches for facility-wide corrective action
- Documentation of the factors that make source area remediation not technically practicable
- Transition from the groundwater IRM to a final remedy involving the application of performance criteria (CMOs) to allow transition from active to passive remediation
- Achieve MCLs and return groundwater to maximum beneficial use.

Long-term cleanup goals will be implemented in terms of clearly defined, facility-specific, media cleanup objectives (*i.e.,* CMOs). Details on the development of groundwater cleanup objectives are provided in Sections 4 through 6.

3.3 SITE-SPECIFIC APPROACH TO CMO DEVELOPMENT

As outlined in the CMS Work Plan, groundwater CMOs for a final remedy at the Facility will be developed to address three specific criteria (USEPA, 2004):

- Groundwater Concentration Objectives
- Cleanup Time Frame(s)
- Performance Monitoring Locations.

Groundwater concentration objectives are defined as facility-specific chemical concentrations in groundwater protective of human health and the environment, which are based on maximum beneficial use of the groundwater (in this case, drinking water as well as discharge to surface water). Therefore, the development of groundwater concentration objectives will include the identification of groundwater use for the primary water-bearing units as well as discharge of Perched zone groundwater to the nearby Mill Creek.

Preliminary groundwater concentration objectives are further developed in the following section. Additional information related to the Cleanup Time Frames and Performance Monitoring Locations are developed in Sections 5 and 6 of this document, respectively.

4.0 DEVELOPMENT OF GROUNDWATER CONCENTRATION OBJECTIVES

As discussed in Section 1.2, GE currently has a groundwater IRM in place, consisting of strategic groundwater pumping and natural attenuation, which is protective under current conditions. Over the last five years of active groundwater pumping and treatment, the IRM is reaching a point where the active remediation program can be gradually transitioned to MNA. The development of groundwater concentration objectives to guide this transition will use the following approach:

- Identify the primary COPCs
  - » Summarize the maximum groundwater concentrations for the southern area of the Facility and off-site
  - » Screen existing groundwater data against USEPA Tapwater Regional Screening Levels (RSLs[3]) and USEPA Drinking Water Maximum Contaminant Levels (MCLs)
- Identify and evaluate migration pathways, potential exposure routes and potential receptors
  - » Present a human health and ecological conceptual site model (CSM) that identifies the current and future potential receptors and exposure routes (dermal, inhalation, ingestion) for impacted groundwater
- Calculate concentration objectives to guide transition from active to passive remediation
  - » Conduct reverse- or back-calculation from theoretical exposure points using modeling, to develop concentration objectives for the southern area of the Facility that would be protective of potential receptors.

Details of this approach are provided in the subsections that follow.

4.1 GROUNDWATER EXPOSURE PATHWAY ANALYSIS

The development of CMOs considers the relationships between land use patterns, chemical source areas, and human and ecological exposure pathways. A human health and ecological CSM is typically used to describe the linkages between possible sources of COPCs and potentially exposed human or ecological receptors. Elements of the CSM are discussed in the following sub-sections, and are used to support the development of risk-based groundwater concentration objectives. The human health and ecological CSM for the Facility is presented in Figure 2.

4.1.1 Identification of COPCs

The most recent data from select groundwater monitoring wells were compiled and tabulated to assess groundwater quality and identify COPCs in on-site and off-site wells. Data from wells along the southern perimeter of the Facility were used to assess groundwater quality on-site. Off-site wells used in the screening assessment are those to the south of the Facility, in the general direction of groundwater flow. Off-site and on-site groundwater wells utilized in the screening evaluation are presented in Figures 3 and 4, respectively.

The screening evaluation was conducted separately for Perched zone, USG, and LSG groundwater given that these are significant groundwater flow zones[4] and the potential use and fate of groundwater in these water-bearing units are generally dissimilar. The screening of off-site groundwater was further partitioned into evaluations of GE-installed wells and wells associated with the nearby Pristine Superfund Site. The Pristine wells were installed

[3] Note that RSLs are generic screening criteria and that development of site-specific screening criteria may be warranted, either as a follow-up to this evaluation, or at some future time if there is interest in redevelopment and change-of-use of select areas.

[4] Distinct groundwater flow zones (*i.e.*, Perched zone, USG, LSG) are secondary to the importance of exposure point concentrations. As highlighted in the Conceptual Site Model (Appendix A, CMS Work Plan, OBG, 2014), hydraulic communication occurs in select areas between these primary groundwater flow zones due to variable thickness of lower permeability silt/clay confining layers.

primarily to monitor a separate groundwater plume associated with the Pristine Site, and employed a different screen-depth selection process than many of the GE wells. The results of the Pristine groundwater monitoring provide support for diminished ambient groundwater quality, and the occurrence of mixed or co-mingled plumes in the area surrounding the Facility. As such, screening of groundwater results from GE wells and from Pristine wells was conducted separately. Results from water supply wells used for monitoring of LSG groundwater at the City of Wyoming wellfield (Wells #1A, #6, #7, #8, #9, and #10) were also included in the screening evaluation of off-site groundwater.

Federal screening criteria protective of the drinking water exposure pathway were used to identify COPCs in groundwater. These criteria include the June 2015 USEPA Tapwater RSLs and USEPA MCLs. To identify COPCs, maximum groundwater concentrations of chemicals in the Perched zone, USG, and LSG were compared to the Tapwater RSLs and MCLs.

For a given constituent, the lower of the Tapwater RSL and MCL was utilized as the screening criterion to provide an appropriate level of conservatism in the COPC identification step. Chemicals were classified as COPCs and retained for CMO development if the maximum detected concentration was greater than the chemical's screening criterion. Note that Perched zone groundwater is not likely to be used for potable purposes; therefore, the application of "drinking water" screening criteria represents a highly conservative approach to identifying COPCs in Perched zone groundwater.

Screening tables for each of the water-bearing units are provided in Tables 2 through 10. These tables show only the key CVOCs as well as other VOCs exceeding the screening level for each separate water-bearing unit. Table 11 summarizes the groundwater COPCs identified in the Perched zone, USG, and LSG for both the southern perimeter on-site wells and the off-site monitoring wells. Based on the results of previous groundwater investigations (see Section 2.3), chemicals evaluated in on-site and off-site groundwater include VOCs, particularly CVOCs and benzene, toluene, ethylbenzene, and xylenes (BTEX). Three COPCs (1,1,2-TCA, 1,2-DCA, and 1,2-dibromoethane) are primarily related to the Pristine site and represent impacts to ambient groundwater quality in the study area. Groundwater monitoring results for the Facility shows 1,2-DCA has been detected only four times since 2005 (concentrations of 0.5 µg/L or less) and 1,2-dibromoethane has never been detected. Since groundwater concentration objectives are only established for groundwater within the Facility boundary, 1,2-dibromoethane has been eliminated from further consideration during the development of CMOs. Constituents such as benzene, chloroform, tetrachloroethene, trans-1,2-dichloroethene, and methylene chloride, the majority of which were detected only in on-site perimeter monitoring wells, were detected at concentrations near or below MCLs. Although concentrations of 1,1,1-TCA did not exceed screening criteria, this constituent was included in the list of key CVOCs for the development of concentration objectives (Section 4.2) due to its broad distribution and historical concentrations in the Facility Perched zone monitoring wells. As a result, groundwater CMO development focused on seven key CVOCs consisting of TCE, 1,1,1-TCA, and their daughter or breakdown products which represent a subset of the highest priority COPCs needed to effectively manage exposure and risk. The following key CVOCs have been identified for development of CMOs:

- 1,1,1-Trichloroethane
- 1,1-Dichloroethane
- 1,1-Dichloroethene
- Trichloroethene
- cis-1,2-Dichloroethene
- trans-1,2-Dichloroethene
- Vinyl Chloride

4.1.1.1 On-Site Perimeter Wells

The COPCs identified in wells along the southern perimeter of the Facility, and their presence in each of the three groundwater units are summarized in Table 11. TCE and VC were present in on-site perimeter wells above screening levels in the Perched zone, USG, and LSG. 1,1-DCA and VC were detected most frequently (*i.e.,* at the most locations) above screening levels in the Perched zone (7 of 10 wells). Monitoring well TMW-1P contained the greatest number of VOCs (8) with concentrations above screening levels (1,1-DCA, 1,1-DCE, 1,2-DCA, benzene,

chloroform, cis-1,2-DCE, TCE, and VC). In the USG, VC was most frequently detected above screening levels (10 of 14 wells), followed by cis-1,2-DCE (7 wells) and 1,1-DCA (6 wells). VC was present most frequently at concentrations above screening levels in the LSG (3 of 9 wells).

4.1.1.2 Off-Site Wells

The COPCs identified in off-site wells (combined GE and Pristine wells), and their presence in each of the three groundwater units are also summarized in Table 11. As indicated, 1,1-DCA, 1,2-DCA, cis-1,2-DCE, TCE, and VC were present in off-site wells above screening levels in each groundwater zone. It is noted that 1,2-DCA is the most extensive groundwater constituent associated with the Pristine site and is used as an indicator of groundwater cleanup progress at that site (USEPA, 2011). TCE was most frequently detected above screening levels in the Perched zone (4 of 10 wells). In the USG, cis-1,2-DCE and VC concentrations were above screening levels in 10 of 17 wells; cis-1,2-DCE was detected above screening levels in 9 USG wells. VC was present at concentrations above screening levels most frequently in the LSG (25 of 58 sample locations); TCE concentrations exceeded screening levels in 23 LSG wells.

4.1.1.3 Summary of Maximum and Recent COPC Concentrations

Table 12 includes the maximum historical concentration and maximum concentration observed in 2015 for each COPC for all monitoring wells (with on-site perimeter wells included as a subset) located on the southern area of the Facility (*i.e.,* former AFP36) for the Perched zone, USG, and LSG. This table also includes relevant regulatory criteria for comparison. As indicated in Table 12, except for 1,2-DCE in the LSG, nearly all COPC concentrations in 2015 have decreased by approximately 50% to 100%, particularly since 2010, as a result of strategic pumping and MNA (Figure 5).

4.1.2 Migration and Exposure Pathways

A groundwater use designation provides clarification and support to the groundwater exposure pathway analysis by identifying reasonable use and potential exposure to groundwater encountered beyond the Facility boundary. The groundwater use designation is a determination of the (1) reasonably expected use(s), (2) resource value (*i.e.*, priority), and/or (3) groundwater vulnerability in a certain area (USEPA, 2004). Ohio EPA's designated use and water quality criteria for the Mill Creek in the area of the Facility were considered in the evaluation of the discharge of the Perched zone to the Mill Creek and the development of CMOs. GE has developed supporting information of groundwater use in the study area (see Appendix A) based on a review of Federal and State groundwater classification or designation, as well as water use and quality designation for the Mill Creek.

Key findings relevant to the groundwater exposure pathway analysis are summarized as follows:

- Due to the presence of Perched/USG and USG/LSG vertical hydraulic communication areas, the entire unconsolidated aquifer of this area of the Mill Creek Valley is considered a current or potential future source of drinking water. The Perched zone is generally not considered an aquifer for potable use and the USG provides lower yields to wells, as compared to the LSG. Historically, nearly all of the groundwater pumped in the Mill Creek Valley has been from the LSG, being used for industrial and municipal purposes, with relatively insignificant residential use. The City of Wyoming is the only nearby downgradient municipality to operate a well field.
- The Mill Creek valley aquifer was excluded from USEPA's designation as a Sole Source Aquifer since the population in this basin depends primarily on surface water for drinking water supply. Based on the groundwater use evaluation, groundwater in the LSG is considered to be classified as USEPA Class IIA and the Perched zone and USG is considered to be USEPA Class IIB groundwater.
- The source water protection area for the City of Wyoming extends from the Wyoming Well Field north-northeast toward I-75 but does not include the GE Facility (see Figure A-2). The likelihood that a drinking water source in the Mill Creek valley aquifer could become contaminated from other sources is moderate to high. This susceptibility rating is largely a function of the history and nature of industrial activity in this area of the Mill Creek Valley that has resulted in diminished ambient groundwater quality in the surrounding area of the Facility.

- Mill Creek is not designated as a public water supply. The portion of the Mill Creek adjacent and downstream of the Facility has a lower level recreational use designation due to rare use and insufficient depths for total body immersion. Ohio EPA water quality assessment (Ohio EPA, 2014) designates this portion of Mill Creek as a non-attainment warm water habitat that is impaired by urban runoff and industrial/municipal discharge.
- Ohio and Hamilton County requirements exist for the permitting, sampling, and abandonment of private water wells. However, there is no system to restrict private well installation or track permit denials via property deeds, and no ordinances prohibiting the installation of such wells in the future are currently in place.
- Groundwater at the Facility currently is not used for potable or industrial purposes and, as documented in the I&EC Plan (OBG, 2015b), will be restricted from future use by an environmental covenant. Groundwater generally occurs at a depth of approximately 15 to 20 feet, which is beyond that available for direct contact by potential receptors (*e.g.*, subsurface workers).
- Beyond the Facility to the south, the land use is mixed industrial, commercial, and residential. As discussed above, the LSG is a current source of drinking water, and the Perched zone and USG are potential future sources of drinking water. With the exception of the Wyoming well field, no potable uses of groundwater were identified within approximately 2 miles southward from the Facility based on a potable well survey conducted in 2013 (see Appendix A).
- The proximity of the study area to a municipal drinking water supply as well as the occurrence of diminished ambient groundwater quality supports the conclusion that groundwater will not be used for drinking water purposes in the foreseeable future (*i.e.*, >30 years).

4.1.3 Current and Future Potential Receptors

Due to the discharge of Perched zone groundwater to Mill Creek, potential human and ecological receptors were evaluated. Based on the human health and ecological CSM (Figure 2) and analysis of surface water and groundwater use, the following potential receptors to groundwater ***were retained*** for further consideration in CMO development.

- Residents - Groundwater in the Perched zone, USG, and LSG migrates from the Facility in the southerly direction, and COPCs have been identified in southern perimeter wells and off-site wells. Consequently, off-site groundwater may migrate toward the Wyoming well field (particularly in the case of the LSG) and at lesser distances from the Facility, and potentially be used by off-site residents for agricultural, industrial, or potable purposes.
- Potential ecological receptors include benthic macroinvertebrates, fish, and avian and mammalian wildlife. These may inhabit and or forage within the reach of Mill Creek, potentially receiving Perched zone groundwater from the Facility.
- Waders - Perched zone groundwater that exits the Facility to the south may discharge to Mill Creek. Because Mill Creek's designated use is protective of recreational uses, wading may occur occasionally in the creek.

The following potential receptors to groundwater ***were not retained*** for further consideration in CMO development.

- Industrial workers, office workers, and trespassers whose activities do not include performing intrusive work, do not and will not incur direct exposure to groundwater.
- Construction workers supporting subsurface excavation work and the ongoing expansion of the Facility and those that that perform general servicing, maintenance, or repair of shallow underground utility lines are also not likely to be subject to exposure due to the general depth to groundwater (*i.e.*, >12 feet in depth).
- Deep Utility Workers - Affected groundwater in the Perched zone is below the typical depth of construction, but may be encountered by deep utility workers in some areas. The I&EC Plan (OBG, 2015b) presents the management plan for construction and utility installation/repair projects. Given these conditions, direct contact exposure pathways for on-site groundwater are considered incomplete.

- Fishing - Recreators may use Mill Creek for fishing; however, the CPOCs that may potentially discharge to the creek do not bioaccumulate to a significant degree. Consequently, recreational anglers that catch and consume fish from the downgradient portion of Mill Creek are not anticipated to be exposed to COPCs identified in perimeter on-site or off-site monitoring wells.

4.1.4 Potentially Applicable Exposure Routes

As discussed previously, groundwater beneath the Facility property is not used for potable or industrial purposes, will be restricted by an environmental covenant, and generally occurs at depths beyond that available for direct contact. Therefore, on-site groundwater pathways are considered incomplete.

The following off-site potential exposure routes ***were retained*** for further consideration in CMO development.

- Groundwater ingestion – Ingestion of USG and LSG groundwater is considered under a hypothetical future scenario in which a resident could drill a well for groundwater supply. Of the potential exposure pathways for off-site groundwater, ingestion is associated with the lowest (most conservative) acceptable concentration guideline values and is selected for consideration in CMO development.
- Inhalation of vapors - Vapor inhalation during showering or bathing is considered under a hypothetical future scenario in which a resident could drill a well for groundwater supply.
- Surface water ingestion - The primary human exposure route for the identified potential receptors at Mill Creek is the incidental ingestion of surface water potentially impacted by Perched zone groundwater from the Facility.
- Ecological exposure routes include direct contact with Mill Creek surface water and sediment by community receptors (benthic invertebrates and fish), ingestion of surface water, and incidental ingestion of sediment by wildlife receptors (*i.e.*, semi-aquatic birds and mammals).

The following off-site potential exposure routes ***were not retained*** for further consideration in CMO development.

- Ingestion of groundwater-irrigated produce - Fruit trees or vegetable plants potentially irrigated with USG or LSG groundwater are not expected to accumulate COPCs.
- Dermal contact - Dermal contact with groundwater or surface water and sediment potentially impacted by Facility groundwater is considered a de minimis exposure route given that COPCs are anticipated to volatilize and be transported away prior to any appreciable absorption across the skin.
- Human fish consumption – The fish consumption pathway is considered de minimis due to the low bioaccumulation potential of the COPCs in potentially affected creek surface water and sediment. Moreover, this creek is on an advisory list for human consumption of fish sourced from this water due to constituents other than VOCs (Ohio EPA, 2014).
- Wildlife ingestion of prey - Ingestion of prey items is not a significant pathway for wildlife receptors based on the low bioaccumulation potential of Perched zone COPCs.

4.2 DEVELOPMENT OF CONCENTRATION OBJECTIVES AT THE SITE PERIMETER

As indicated in the CMS Work Plan, preliminary analysis was conducted using published water quality criteria applied at theoretical potential receptors, and reverse- or back-calculating from these theoretical exposure points to develop concentration objectives at the Facility boundary. The attached conceptual diagrams (Figures 6 and 7) illustrate the process for theoretical potential receptors at the Mill Creek for the Perched zone and the Wyoming well field for the LSG, respectively. As noted in Section 4.1.1, groundwater CMO development focused on seven key CVOCs consisting of TCE, 1,1,1-TCA, and their daughter or breakdown products which represent a subset of the highest priority COPCs needed to effectively manage exposure and risks.

Development of CMOs involved the following primary steps:

- Step 1 - Model calibration and sensitivity analysis, establishing key input parameters, particularly the biodegradation rate (λ)

- Step 2 - Back calculation from theoretical exposure points to the Facility boundary using the calibrated model and established biodegradation rate (λ)
- Step 3 - Back calculation from theoretical exposure points to the Facility boundary using the calibrated model and several simplifying, conservative assumptions, including 50% reduction of the biodegradation rate, to identify CMOs.

The details of this process are presented in the following subsections.

4.2.1 Model Calibration

An analytical fate and transport model was calibrated using chemical data from existing monitoring well locations and adjusting model parameters within reasonable ranges for the various hydrogeologic and subsurface transport values. The analytical groundwater flow and transport model BIOCHLOR Version 2.2, developed for USEPA (USEPA, 2000; Aziz *et al.*, 2002) was utilized to evaluate biodegradation of COPCs, with a primary focus on the key CVOC TCE and its daughter products within the Perched zone and LSG. Model input and graphical results from BIOCHLOR are included in Appendix B.

Highlights of the model calibration process include:

- Perched zone simulations used existing well data from AF-7P to estimate the source concentrations to provide a good match to existing site data using a line of wells to the Mill Creek, including PMW-3P, OSMW-10P and H-221 (Figure 6). This hypothetical source zone was 700 feet wide and centered about AF-7P laterally with a thickness of 20 feet based on the average (pre pumping) saturated thickness of the Perched zone.
  - The Perched zone simulations were calibrated against the 2013 data for AF-7P, PMW-3P, OSMW-10P and H-221using the 2001 data for AF-7P as the source concentrations and a 12-year simulation time period. The 2001 data for AF-7P included the third highest TCE result (1,140 µg/L). (The February 2000 data contained the highest TCE result at 1,440 µg/L, but would have required higher decay rates [less conservative] to allow calibration).
- The LSG simulations included a hypothetical source zone located 220 feet upgradient of OSMW-3D. This allowed the simulation of degradation downgradient of the source area for a more realistic and better calibration to the data at OSMW-3D and further downgradient. This hypothetical source zone was 450 feet wide and centered about OSMW-3D laterally with a thickness of 56 feet. This includes the central portion of the LSG that represents the zone of impacts within that water-bearing unit (Figure 7).
  - The LSG simulations were calibrated against the 2004 and 2014 data for OSMW-3D using a 60-year simulation time period (estimate of steady-state based on historical operations at the Facility). Note that 2005 data for OSMW-6D and 2006 data for OSMW-8D, along with the 2014 data for these wells, were used since these two wells were installed after OSMW-3D was installed in 2004. The 2004 data for OSMW-3D included the highest concentration results.

The calibrated model achieved a good correlation with sampling results at off-site wells (see Appendix B). Following calibration, sensitivity analysis was performed on the modeling input parameters and the model was determined to be most sensitive to the decay (biodegradation) rates used for the individual constituents (Appendix B), followed by source concentration and travel distance. The selection of these parameter values is discussed below.

4.2.1.1 Travel Distance

The estimated concentration at a specified location from the source area is, in part, a function of the solute travel distance. This parameter is generally constrained by the actual distance between the source and exposure point. In the Perched zone, the initial travel distance was derived from interpretation of flow direction from the southernmost Perched zone extraction well, EW-4P, to the creek. As shown in Figure 6, this distance was reduced from the calibration distance of 1,920 feet to 840 feet, the shortest distance perpendicular to Mill Creek. This reduction in the travel distance during the back-calculation process resulted in a more conservative estimate of predicted concentrations at the Facility and Mill Creek.

Previous groundwater flow evaluations indicate that the direction of groundwater flow from simulated sources in the LSG is generally to the south-southwest, and not toward the Wyoming Wellfield from the southeastern end of the Facility. This is reflected in the distribution of the 5-yr particle capture zone for the Wyoming Wellfield (see Figure 7), as documented for the City of Wyoming (Eagon & Associates, Inc., 1999). However, as a conservative approach for CMO development, solute travel distance was based on a shorter assumed flowpath directed cross-gradient from the southern Facility boundary directly to the Wyoming Wellfield (Figure 7).

It is not known whether communication areas exist between the USG and LSG in areas closer to the Wyoming well field. However, the travel time of key CVOCs within the USG is estimated to be greater than in the LSG due to a higher travel distance for key CVOCs in the USG to reach the well field completed within the LSG (all other conditions being equal). Therefore, the modeling was focused on the LSG as a conservative estimate. The solute travel distance in the LSG is shown in Figure 7 as the distance between the southern property boundary and the Wyoming Well Field.

4.2.1.2 Source Concentration

For the Perched zone, existing well data from AF-7P, near the area of highest concentrations and Perched extraction wells (Figure 4), were used to estimate the source concentrations. As a result, further modification of the source concentrations was not conducted during the calibration process. Instead, the biodegradation rates were adjusted to allow for a good calibration match with the existing downgradient well data.

For the LSG, because the location and concentrations of the source are less precisely known, the estimated source concentrations were adjusted upward from the concentrations observed at OSMW-3D to provide a good match to existing site data for OSMW-3D using a degrading source zone. The biodegradation rates were also adjusted during this iterative process of establishing the source concentrations to allow a good match with the existing data.

4.2.1.3 Biodegradation

Available site and chemical data were utilized to calibrate BIOCHLOR to estimate biodegradation rates for TCE and daughter products within the Perched zone and LSG. In addition, other sources of information were utilized to establish a reasonable range of values during the BIOCHLOR modeling effort. These information sources included published first order decay (degradation) rates and half-life data, site specific degradation rates from microcosm and isotope studies, (OBG, 2010a) and pumping test and tracer test derived hydraulic conductivity results (OBG, 2009). Values used for BIOCHLOR input parameters are summarized in Appendix B.

4.2.2 Proposed CMOs

As explained further in Section 6 of this document, the CMOs are anticipated to guide decision-making about the transition of remediation technologies from P&T to MNA. CMO development therefore considered 1) the ability of natural attenuation to reach threshold concentrations (*i.e.*, drinking water or surface water standards) at potential exposure points and 2) the potential for rebound after extraction well shutdown. The general concept for this decision-making process is explained in Appendix C.

OBG used the calibrated model (that included the established biodegradation rate) in developing CMOs for the Facility as follows:

- To simulate the effectiveness of natural attenuation, OBG used the calibrated model to simulate solute fate and transport from the site boundary to the potential exposure points. Using an iterative process, simulated source concentrations were increased until simulated concentrations at the potential exposure points reached threshold concentrations (*i.e.*, drinking water or surface water standards). This is hereinafter referred to as back-calculation modeling. The corresponding concentrations at the property boundary derived for the calibrated and back-calculated simulations are shown in Tables 13 and 15.
- Groundwater IRM operation has already reduced actual concentrations in some areas to below the back-calculated property boundary values (see Tables 13 through 15 and time-series concentration graphs in Appendix D). To preserve these gains during transition from P&T to MNA, OBG simulated a conservative set of

concentration objectives by applying multiple conservative assumptions to the input parameters. The application of simplifying assumptions is intended to facilitate the modeling process, while the highly conservative nature of these assumptions is intended to provide greater confidence and a greater safety factor for CMO development.

- A particularly noteworthy assumption is that, using the same iterative process discussed above, the calibrated biodegradation rate was reduced by 50% (*i.e.*, $\lambda/2$) and simulated source concentrations were increased until simulated concentrations at the potential exposure points reached the threshold concentrations. Other conservative assumptions are highlighted below.
- The back-calculated concentrations at the property boundary formed the CMOs. These values are shown in Tables 13-15.

Additional details of the CMO development are provided below.

4.2.2.1 Perched Zone and Mill Creek

In the case of the Mill Creek, the regulatory criteria at the point of exposure are the Ohio non-drinking water numerical water quality standards and/or ecological criteria for surface water. These criteria are the most conservative of the relevant Federal and State water quality standards for surface water. Proposed CMOs for the Perched zone at the site boundary were back-calculated based on multiple simplifying, conservative assumptions and simulated attainment of these standards in groundwater near Mill Creek (Table 13). Highlights of the back-calculation process for the Perched zone included:

- During sensitivity analysis, solute travel distance was found to have a significant effect on results. Therefore, the calibrated flow distance of 1,920 feet from AF-7P to Mill Creek in the southerly direction was reduced to 840 feet (the shortest distance to Mill Creek) in the easterly direction during the back-calculation process to provide an additional degree of conservatism.
- The back-calculation process focused on the chlorinated ethenes (TCE, undifferentiated DCE [cis/trans-1,2-DCE and 1,1-DCE], VC). There are no Ohio numerical water quality standards for 1,1,1-TCA, 1,1-DCA or cis-1,2-DCE, and historical concentrations of the remaining COPCs have been below Ohio water quality standards.
- Perched zone simulations of biodegradation to undifferentiated DCE were treated as 1,1-DCE[5], based on the following considerations. Modeling of TCE biodegradation provided results for undifferentiated DCE and VC. Also, surface water quality standards are not available for cis-1,2-DCE. As a result, back-calculated values of undifferentiated DCE were applied as concentration objectives for 1,1-DCE, for which surface water quality standards are available. As explained below, this is a highly conservative approach that has the effect of decreasing the back-calculated values for TCE and VC.
- The surface water criterion for 1,1-DCE is 32 µg/L. For modeling purposes, this value was used as a potential exposure point criterion by applying it to groundwater next to Mill Creek. The application of the 1,1-DCE surface water standard to groundwater (as opposed to surface water) is a highly conservative/protective approach. Using this value as a criterion for groundwater next to Mill Creek, the back-calculated value for 1,1-DCE at the property line is 39 µg/L.
- The surface water criteria for TCE and VC are 810 and 5300 µg/L, respectively. The surface water criterion for 1,1-DCE (32 µg/L) is relatively low compared to the criteria for TCE and VC. As a result, modeling results indicated that the 1,1-DCE potential exposure point criterion (32 µg/L) is the "driver" for back-calculation of

[5] While 1,1-DCE can occur as a biodegradation product of TCE via reductive dechlorination, it is also commonly produced via abiotic degradation of 1,1,1-TCA. Due to computer model limitations, the specific DCE constituent (cis/trans-1,2-DCE and 1,1-DCE) is undifferentiated but is typically considered to be dominated by cis-1,2-DCE. However, since surface water quality criteria do not exist for cis-1,2-DCE, the compound 1,1-DCE was used as a highly conservative surrogate for undifferentiated DCE.

TCE and VC criteria at the property line. Using a 1,1-DCE value of 32 µg/L as the potential exposure point objective:

- The back-calculated value for TCE at the property line was 920 µg/L
- The back-calculated value for VC at the property line was 25 µg/L.

The above-listed values for the property line for TCE (920 µg/L), 1,1-DCE (39 µg/L), and VC (25 µg/L) are being proposed as CMOs. Review of recent groundwater concentrations in the Perched zone near the southeast property boundary suggests that continued P&T operation may attain the proposed CMOs (see Table 13 and Appendix D) in the next few years.

4.2.2.2 Lower Sand and Gravel

In the case of the Wyoming well field, the regulatory criteria at the point of exposure are USEPA primary drinking water standards. The back-calculation considered both the attenuation of TCE, and the formation of undifferentiated DCE and VC as a biodegradation by-product of TCE attenuation, with emphasis on the TCE to cis-1,2-DCE to VC degradation pathway. Historical concentrations of the remaining COPCs have been below USEPA primary drinking water standards. The conservative back-calculated, proposed CMOs for TCE, cis-1,2-DCE, and VC at the south property boundary for the LSG are 260 µg/L, 155 µg/L, and 50 µg/L, respectively (see Table 15). Review of recent groundwater concentrations in the LSG near the south property boundary (*i.e.*, OSMW-3D) suggests that continued P&T operation may attain the proposed CMOs (Table 15 and Appendix D) relatively soon.

4.2.2.3 Upper Sand and Gravel

As indicated in Section 4.2.1.1, the travel time of key CVOCs within the USG is estimated to be greater than in the LSG and the modeling of solute travel through the USG was based on conditions in the LSG as a conservative approach. Therefore, the conservative back-calculated, proposed CMOs for TCE, cis-1,2-DCE, and VC at the southwest property line for the USG are the same as for the LSG: 260 µg/L, 155 µg/L, and 50 µg/L, respectively (see Table 14). Prior to reduced pumping capacity and trial testing of EW-7S (approximately June 2013), recent groundwater concentrations in the USG at near the southwest property boundary (*i.e.*, OSMW-4S) were generally at or below the proposed CMOs (Table 15 and Appendix D).

4.2.2.4 Summary

Concentration objectives were developed through modeling of observed input parameters and several conservative, simplifying assumptions. Simulated results for concentrations at the Facility derived from (1) the calibrated model, (2) the back-calculated model (with calibrated λ) and (3) the modified back-calculated model (calibrated $\lambda/2$) are summarized in Tables 13 and 15 for the Perched zone and LSG, respectively. Under the assumptions noted previously, back-calculated values for the LSG have been applied to the USG (Table 14). The maximum historical and 2015 concentrations for select monitoring wells and extraction wells are also shown for comparison in Tables 13 through 15. The lower (more conservative) of the two sets of back-calculated values in each table are designated as the proposed CMOs (highlighted in blue). The proposed CMOs for the Perched zone, USG, and LSG are summarized in Table 16.

5.0 REMEDIAL TIME FRAMES

The following discussion of remedial time frames is based on current and reasonably anticipated future land use assumptions in the off-site area downgradient of the Facility. CMOs are estimated to be attained over the next 5 years based on current IRM performance monitoring results. In contrast, the time frame to achieve the long-term cleanup goal of MCLs is estimated at greater than 30 years, based on the factors described below.

5.1 HYDROGEOLOGIC CHARACTERISTICS AND EXTENT OF IMPACTED MEDIA

Predictions of cleanup timeframe at the Facility are complicated by:

- Hydrogeologic factors: The underlying aquifer is characterized by a multilayered system of very low- to moderate-permeability unconsolidated strata.
- COPC-related factors: The presence and persistence of residual CVOCs in the fine-grained materials, numerous subsurface residual sources, slow pace of back-diffusion, and excessive depths of CVOCs are all site-related factors that limit the ability to achieve long-term cleanup goals within the reasonably foreseeable future.

In summary, and as outlined in the CMS Work Plan, the review of IRM alternatives has demonstrated that in-situ source remediation measures would not achieve long-term IRM goals in a reasonable timeframe due to long-term dissolution of CVOCs from residual sources in less permeable strata.

5.2 POTENTIAL EXPOSURE RISKS AND CONTROLS

Under current land use conditions, the groundwater IRM continues to protect potential receptors (City of Wyoming, Mill Creek). In addition, the City of Wyoming air stripper provides an extra level of protectiveness for the groundwater pathway. Key points summarized from Section 4 that support an extended cleanup time frame include:

- Groundwater at the Facility is not used for potable or industrial purposes, will be restricted by an environmental covenant, and generally occurs at depths beyond that available for direct contact. Therefore, on-site groundwater pathways are considered incomplete.
- Beyond the Facility to the south, the land use is mixed industrial, commercial, and residential. The LSG is a current source of drinking water at the Wyoming Well Field, and the Perched zone, USG, and LSG are potential future sources of drinking water. As indicated in Section 4.1.2, and with the exception of Wyoming Well Field, off-site groundwater will not be used for drinking water purposes in the foreseeable future (*i.e.*, >30 years) based on the following:
  - No potable uses of groundwater within approximately 2 miles southward from the Facility based on a potable well survey conducted in 2013
  - The proximity of off-site population to a safe and reliable municipal drinking water supply
  - The occurrence of impacted regional or ambient groundwater quality
  - The existence of state and county requirements for the permitting, sampling, and abandonment of private water wells

GE will provide the Hamilton County Public Health Division of Water Quality with a map of potentially affected groundwater so they can control future well installation permit applications based on current conditions in the affected areas. As an additional protective measure, GE will conduct periodic reviews of public records (*e.g.*, boring/well logs and well permits for off-site groundwater use) and provide annual documentation of the review results.

6.0 TECHNOLOGY SELECTION AND PERFORMANCE MONITORING

6.1 TECHNOLOGY SELECTION

During the previous (circa 2008) screening and selection of IRM technologies, GE considered the universe of applicable technologies and, with USEPA consent, selected P&T as the most appropriate form of active remediation. In the Corrective Measures Study (CMS), GE will build upon this previous screening by reviewing new technologies since the IRM screening, to confirm that P&T and MNA continue to be the most applicable and effective technologies to achieve the CMOs and long term cleanup goals.

6.2 GUIDELINES FOR TRANSITION OF REMEDIATION TECHNOLOGIES

In this document, OBG proposes CMOs that will be used to guide decisions about the selected remediation technologies, including whether P&T at specific locations may be replaced by MNA. The decision-making process regarding partial or permanent shutdown will be described in an amended Performance Monitoring Plan during Corrective Measures Implementation. Based on past technology evaluations and successful performance of the IRM, it was assumed that the selected technologies will be P&T and MNA; however, the CMOs are also applicable to the use of other technologies.

The numerical values of the proposed CMOs are described in Section 4. The CMOs are concentration objectives at specified monitoring locations. The southern perimeter of the Facility was selected for CMO development and performance monitoring locations based on the following:

- Groundwater flow from the Facility is generally to the south. Locations along the southern perimeter can be monitored to represent a reasonable worst-case of COPC flux from the site.
- Impacted groundwater has been identified in off-site monitoring wells downgradient of the Facility.
- Potential groundwater contact points (*i.e.*, Mill Creek, Wyoming well field) are present in downgradient areas.
- Groundwater beneath the Facility is not used nor is it likely to be used in the future.
- The groundwater IRM has an established performance monitoring network and is located on the south end of the Facility.

6.3 THE MONITORING APPROACH

The performance monitoring approach will follow the Data Quality Objectives (DQO) decision-making approach, and is described in the IRM Performance Monitoring Plan (PMP, OBG 2010). Highlights of the approach include:

- Monitoring decisions and guidelines, including attainment of CMOs, will be described in a monitoring plan. The plan will describe monitoring locations, methods, and frequency.
- CMO attainment will be evaluated by monitoring of influent sampling results from each extraction well and sampling results from nearby perimeter monitoring wells.
- Proposals to transition from pumping at specific locations to MNA will be presented to, and coordinated with, USEPA.
- After shutdown of individual extraction wells, concentration rebound will be monitored at the extraction well and surrounding monitoring points to verify that conditions remain compatible with MNA.

Additional information is provided in Appendix C. Assuming USEPA approval of the concepts in this report, GE will update the IRM Performance Monitoring Plan (PMP) during Corrective Measures Implementation.

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Tables

Table 1
Screening Evaluation summary for SWMUs/AOCs
GE Aviation - Edendale, Ohio

SWMU Number	Unit Name	IRP Site No.	RFA	RFI		Recommended Further Action[3]
			Evidence of Release	Results Above Industrial RSLs[1]	Retained Metals Above Background?[2]	
8/12	Temporary Drum Storage Area (Former Bldg. 509) / Drum Crusher Unit		Yes	TCE, benzo[a]pyrene, benzo[b]fluoranthene, TPH, PCBs, As	None	CMS
14	Battery Storage Area		Yes	As	None	--
16	Weigh Station Sump		Yes	TPH, As	As	CMS
17	Reading Road Landfill		Yes	As	As	CMS
18	Sludge Basin Landfill		Yes	TPH, As	As	CMS
19	East Landfarm		No	As	None	--
20	Former North Landfarm		No	Benzo[a]pyrene, benzo[b]fluoranthene, As	None	CMS
21/22	Former 508 Sludge Basin		Yes	TCE, benzo[a]pyrene, benzo[b]fluoranthene, PCBs, TPH, As, CN, Ni	Ni	CMS
27/28	Former Lime Precipitate Basins 1 and 2		Yes	As	As	CMS
29	Lime Precipitate Basin 3		Yes	As	None	--
31	Lime Precipitate Basin 5		Yes	TPH, As	None	CMS
42	Former Chip Loading Area	SS-20	No	--	--	--
61/67	Underground Waste Oil/Fuel Storage Tank 304-7		No	--	--	--
79	Former Bldg. 800 Wastewater Pretreatment System		No	--	--	--
86	Oil/Water Separator 301-2		No	--	--	--
87/88	Oil/Water Separators 303-1 and 303-3		No	PCBs, As	None	CMS
93/94	Oil/Water Separators 500-1E and 500-1W		No	TPH, As	None	CMS
95	Oil/Water Separator 500-2		No	--	--	--
98/99	Oil/Water Separators 703-1E and 703-1W		No	--	--	--
100	Oil/Water Separator 707-1		No	As	None	--
118	Process Sewer System - Sanitary Sewer	SD-23	No	PCBs	--	IRP
122	Stormwater Pumphouse 422		No	As	None	--
123	Stormwater Pumphouse 423		No	As	None	--
124	Stormwater Pumphouse 506		No	As	As	CMS
141	Gravel Media Coalescing Separator	SD-26	No	TPH	--	IRP
142	Bldg. 800 Machine Sump (Added 1/16/91)		No	TPH, As	None	CMS
AOC A	Bldg. P Fuel Spill	SS-27	Yes	--	--	--
AOCs D and I	Bldg. B Fuel Spills No. 1 and 2	SS-28/SS-29	Yes	TPH	--	IRP
AOC L	Bldg. 304 Fuel Spill		Yes	TPH	-	CMS
AOC W2 / SWMUs 62/63	Inactive Underground Product Storage Tanks 417-E M-1; Underground Waste Oil/Fuel Storage Tanks 417-2 and 417-3		Unknown	--	--	--
AOC W3 / SWMUs 64/68	Inactive Underground Product Storage Tanks 515-1 to 27		Unknown	TPH	--	CMS
AOC W4 / SWMU 65	Inactive Underground Product Storage Tanks 507-5,6,13,14		Unknown	TPH	--	CMS
AOC W10 / SWMU 72	Inactive Underground Product Storage Tanks D-1 to 5	ST 15-19	Unknown	TPH	--	IRP
AOC LD	Bldg. 700 South Loading Dock		Yes	TCE	--	CMS
AOC PST	TCE/TCA Product Storage Tanks		Yes	TCE	--	CMS

Notes:
RSL - Regional Screening Level
(1) Analytical results were compared to USEPA Industrial Soil RSLs (January 2015). SWMUs/AOCs shaded in green contain chemicals whose maximum concentrations are below Industrial RSLs or have concentrations that are consistent with background levels
(2) This column refers to metals with maximum concentrations above Industrial RSLs and soil background concentrations reported for the Cincinnati area (Ohio EPA, 2015).
(3) Under Recommended Further Action:
CMS - Indicates Corrective Measures Study
IRP - Indicates future investigations and/or a Corrective Measures Study

Table 2
Screening of Chemicals in Perched Zone Groundwater - Off-Site GE Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	H-221 6/18/2015	OSMW-1P 6/18/2015	OSMW-2P 6/18/2015	OSMW-11P 6/15/2015	OSMW-12P 6/15/2015	OSMW-13P 6/16/2015
1,1,1-Trichloroethane	200	71-55-6	15	< 1	< 1	< 1	2.8	< 1
1,1-Dichloroethane	2.7	75-34-3	< 1	2.3	5.5	1.1	2	2.5
1,1-Dichloroethene	7	75-35-4	0.76	< 1	< 1	< 1	< 1	< 1
1,2-Dichloroethane	0.17	107-06-2	< 1	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	3.6	156-59-2	0.82	< 1	20	1.4	< 1	0.92
trans-1,2-Dichloroethene	36	156-60-5	< 1	< 1	< 1	< 1	< 1	< 1
Trichloroethene	0.28	79-01-6	38	< 1	< 1	< 1	3.4	< 1
Vinyl Chloride	0.019	75-01-4	< 1	< 1	21	< 1	< 1	< 1

Notes:
Units are ug/L (ppb).
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.
1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 3
Screening of Chemicals in Perched Zone Groundwater - Off-Site Pristine Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	GW50 8/7/2015	GW53 8/7/2015	GW64 8/7/2015	GW66* 8/23/2004
1,1,1-Trichloroethane	200	71-55-6	< 1.0	< 1.0	< 1.0	< 0.01
1,1-Dichloroethane	2.7	75-34-3	6.8	0.66 J	< 1.1	< 0.01
1,1-Dichloroethene	7	75-35-4	< 1.0	< 1.0	< 1.2	< 0.01
1,2-Dichloroethane	0.17	107-06-2	< 1.0	3.1	1.1	< 0.01
cis-1,2-Dichloroethene	3.6	156-59-2	4.8	9.3	< 1.0	< 0.01
trans-1,2-Dichloroethene	36	156-60-5	< 1.0	0.78 J	< 1.0	< 0.01
Trichloroethene	0.28	79-01-6	0.46 J	0.38 J	< 1.0	< 0.01
Vinyl Chloride	0.019	75-01-4	0.68 J	< 1.0	< 1.0	< 0.01

Notes:
Units are µ/L (ppb).
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.
* No data from 2015 was available; data reflects most recent available
1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 4
Screening of Chemicals in Upper Sand and Gravel Groundwater - Off-Site GE Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	GM-7S 4/8/2010	H-219 4/21/2003	H-222 11/29/2010	OSMW-1S 6/18/2015	OSMW-5S 6/19/2015	OSMW-6S 6/18/2015
1,1,1-Trichloroethane	200	71-55-6	< 1	< 0.01	76	< 1	< 1	< 1
1,1-Dichloroethane	2.7	75-34-3	< 1	< 0.01	53	< 1	2.6	< 1
1,1-Dichloroethene	7	75-35-4	< 1	< 0.01	12	< 1	< 1	1.3
1,2-Dichloroethane	0.17	107-06-2	< 1	< 0.01	< 2	< 1	< 1	< 1
Benzene	0.45	71-43-2	< 1	--	< 2	0.52	< 1	< 1
Chloroform	0.22	67-66-3	< 1	--	< 2	< 1	< 1	< 1
cis-1,2-Dichloroethene	3.6	156-59-2	< 1	5.4	63	20	13	8.4
trans-1,2-Dichloroethene	36	156-60-5	< 1	< 0.01	2	< 1	< 1	< 1
Trichloroethene	0.28	79-01-6	< 1	< 0.01	130	< 1	< 1	< 1
Vinyl Chloride	0.019	75-01-4	< 1	< 0.01	26	65	6.6	2.8

Notes:
Units are µg/L (ppb).
'--' denotes the constituent was not analyzed.
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 4
Screening of Chemicals in Upper Sand and Gravel Groundwater - Off-Site GE Wells
GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: / Sample Date: / CAS #	OSMW-8S 6/16/2015	OSMW-9S 6/16/2015	OSMW-11S 6/15/2015	OSMW-12S 4/13/2011	OSMW-13S 4/13/2011
1,1,1-Trichloroethane	200	71-55-6	< 1	< 1	< 1	< 1	< 4
1,1-Dichloroethane	2.7	75-34-3	12	0.63	< 1	71	21
1,1-Dichloroethene	7	75-35-4	< 1	1.1	< 1	7.3	1.8
1,2-Dichloroethane	0.17	107-06-2	< 1	< 1	< 1	< 1	< 4
Benzene	0.45	71-43-2	< 1	< 1	< 1	0.97	< 4
Chloroform	0.22	67-66-3	< 1	< 1	< 1	< 1	< 4
cis-1,2-Dichloroethene	3.6	156-59-2	2.7	55	< 1	190	270
trans-1,2-Dichloroethene	36	156-60-5	< 1	< 1	< 1	9.4	< 4
Trichloroethene	0.28	79-01-6	< 1	< 1	< 1	< 1	4.6
Vinyl Chloride	0.019	75-01-4	4.5	160	2.6	53	84

Notes:
Units are µg/L (ppb).
'--' denotes the constituent was not analyzed.
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 5

Screening of Chemicals in Upper Sand and Gravel Groundwater - Off-Site Pristine Wells

GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	GW63 8/7/2015	GW65 8/7/2015	MW71 8/3/2015	MW74 8/4/2015	MW77 8/6/2015	MW107 7/30/2015
1,1,1-Trichloroethane	200	71-55-6	< 8.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.5
1,1-Dichloroethane	2.7	75-34-3	< 8.0	0.68 J	0.51 J	< 1.0	< 1.0	13
1,1-Dichloroethene	7	75-35-4	< 8.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.5
1,2-Dichloroethane	0.17	107-06-2	250	5.1	< 1.0	< 1.0	0.24 J	< 2.5
Benzene	0.45	71-43-2	< 8.0	< 1.0	< 1.0	< 1.0	< 1.0	< 2.5
Chloroform	0.22	67-66-3	5.3 J	< 1.0	< 1.0	< 1.0	< 1.0	< 2.5
cis-1,2-Dichloroethene	3.6	156-59-2	< 8.0	7.8	2.5	< 1.0	0.41 J	74
trans-1,2-Dichloroethene	36	156-60-5	< 8.0	0.39 J	< 1.0	< 1.0	< 1.0	3.3
Trichloroethene	0.28	79-01-6	< 8.0	3.1	18	< 1.0	0.44 J	< 2.5
Vinyl Chloride	0.019	75-01-4	< 8.0	< 1.0	< 1.0	< 1.0	< 1.0	4.4

Notes:

Units are µg/L (ppb).

'--' denotes the constituent was not analyzed.

'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 6

Screening of Chemicals in Lower Sand and Gravel Groundwater - Off-Site GE and City of Wyoming Wells

GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: Start Depth: CAS #	H-218 4/21/2003	H-220 4/21/2003	H-223 12/6/2010	H-224 4/21/2003	OSMW-11D 6/15/2015	OSMW-1D 6/18/2015	OSMW-5D 6/19/2015	OSMW-6D 6/18/2015
1,1,1-Trichloroethane	200	71-55-6	< 0.01	< 0.01	< 1	< 0.01	< 1	< 1	< 2	< 1
1,1-Dichloroethane	2.7	75-34-3	< 0.01	< 0.01	< 1	< 0.01	22	1.5	< 2	3.7
1,1-Dichloroethene	7	75-35-4	< 0.01	< 0.01	< 1	< 0.01	2.5	< 1	< 2	< 1
1,2-Dichloroethane	0.17	107-06-2	< 0.01	< 0.01	< 1	9.6	< 1	< 1	< 2	< 1
cis-1,2-Dichloroethene	3.6	156-59-2	93	100	< 1	4.6	210	1.3	170	16
trans-1,2-Dichloroethene	36	156-60-5	< 0.01	< 0.01	< 1	< 0.01	5.5	< 1	5.4	< 1
Trichloroethene	0.28	79-01-6	< 0.01	11	< 1	< 0.01	20	< 1	< 2	< 1
Vinyl Chloride	0.019	75-01-4	3.5	15	< 1	< 0.01	3.2	8.1	5.2	140

Notes:

Units are µg/L (ppb).

'--' denotes the constituent was not analyzed.

'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 6

Screening of Chemicals in Lower Sand and Gravel Groundwater - Off-Site GE and City of Wyoming Wells

GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: Start Depth: CAS #	OSMW-7D 6/16/2015	OSMW-8D 6/16/2015	OSMW-9D 6/16/2015	OSMW-11DD 4/13/2011	OSMW-12D 4/13/2011	OSMW-12DD 4/13/2011	OSMW-13D 4/13/2011
1,1,1-Trichloroethane	200	71-55-6	< 1	< 1	< 1	< 5	< 1	3.4	< 5
1,1-Dichloroethane	2.7	75-34-3	< 1	< 1	< 1	36	< 1	2.1	5.6
1,1-Dichloroethene	7	75-35-4	< 1	< 1	< 1	5.4	< 1	< 1	< 5
1,2-Dichloroethane	0.17	107-06-2	< 1	< 1	< 1	< 5	< 1	< 1	< 5
cis-1,2-Dichloroethene	3.6	156-59-2	< 1	3.3	< 1	370	12	< 1	340
trans-1,2-Dichloroethene	36	156-60-5	< 1	< 1	< 1	7.1	< 1	< 1	< 5
Trichloroethene	0.28	79-01-6	< 1	< 1	< 1	6.6	< 1	3.2	< 5
Vinyl Chloride	0.019	75-01-4	6.2	45	12	22	19	< 1	130

Notes:

Units are µg/L (ppb).

'--' denotes the constituent was not analyzed.

'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 6

Screening of Chemicals in Lower Sand and Gravel Groundwater - Off-Site GE and City of Wyoming Wells

GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: Start Depth: CAS #	OSMW-13DD 4/13/2011	Well #10 10/1/2009	Well #1A 10/1/2009	Well #6 10/1/2009	Well #7 10/1/2009	Well #8 10/1/2009	Well #9 8/31/2009
1,1,1-Trichloroethane	200	71-55-6	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1,1-Dichloroethane	2.7	75-34-3	4.3	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1,1-Dichloroethene	7	75-35-4	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
1,2-Dichloroethane	0.17	107-06-2	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
cis-1,2-Dichloroethene	3.6	156-59-2	140	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
trans-1,2-Dichloroethene	36	156-60-5	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Trichloroethene	0.28	79-01-6	< 2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Vinyl Chloride	0.019	75-01-4	70	0.74	0.44	2.02	< 1	3.79	< 1

Notes:

Units are µg/L (ppb).

'--' denotes the constituent was not analyzed.

'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 7

Screening of Chemicals in Lower Sand and Gravel Groundwater - Off-Site Pristine Wells

GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	MW100 7/28/2015	MW101 7/22/2015	MW102 8/14/2015	MW103 7/24/2015	MW104 7/28/2015	MW105 7/28/2015	MW106 7/30/2015	MW68 8/5/2015	MW69 8/4/2015	MW70 8/4/2015	MW72 7/31/2015	MW73 7/31/2015
1,1,1-Trichloroethane	200	71-55-6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<10	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	0.041	79-00-5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 10	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	2.7	75-34-3	6.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	4.2 J	< 1.0	< 1.0	< 1.0	0.54 J
1,1-Dichloroethene	7	75-35-4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 10	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	0.0075	106-93-4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 10	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	0.17	107-06-2	0.47 J	2.1	< 1.0	< 1.0	2.0	< 1.0	< 1.0	250 J	1.7	3.4	< 1.0	< 1.0
Benzene	0.45	71-43-2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	7.7 J	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	0.22	67-66-3	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	4.0 J	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	3.6	156-59-2	3.7	2.8	12	0.99 J	13	9.9	< 1.0	19	0.30 J	2.2	2.6	0.55 J
Tetrachloroethene	4.1	127-18-4	< 1.0	< 1.0	< 1.0	13	< 1.0	< 1.0	< 1.0	8.1 J	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	36	156-60-5	< 1.0	< 1.0	0.50 J	< 1.0	0.68 J	0.99 J	< 1.0	< 10	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	0.28	79-01-6	0.22 J	0.85 J	18	3	26	< 1.0	< 1.0	2.7 J	0.40 J	< 1.0	2.8	0.58 J
Vinyl Chloride	0.019	75-01-4	0.79 J	< 1.0	< 1.0	< 1.0	1.7	< 1.0	< 1.0	4.9 J	< 1.0	27	< 1.0	< 1.0

Notes:
Units are µg/L (ppb).
'--' denotes the constituent was not analyzed.
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.
* NO values available from 2015 data. Data given is most recent available
1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 7

Screening of Chemicals in Lower Sand and Gravel Groundwater - Off-Site Pristine Wells

GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	MW75 8/3/2015	MW76 8/4/2015	MW78 8/6/2015	MW79 8/6/2015	MW80 8/11/2015	MW81 8/10/2015	MW82 8/11/2015	MW83 8/5/2015	MW84 8/5/2015	MW85 8/5/2015	MW86 7/31/2015	MW87 7/29/2015
1,1,1-Trichloroethane	200	71-55-6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.99 J	< 1.0	< 1.0
1,1,2-Trichloroethane	0.041	79-00-5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	2.7	75-34-3	< 1.0	< 1.0	< 1.0	< 1.0	0.60 J	< 1.0	< 1.0	< 1.0	0.34 J	0.42 J	2.6	13
1,1-Dichloroethene	7	75-35-4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.56 J
1,2-Dibromoethane	0.0075	106-93-4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	0.17	107-06-2	< 1.0	< 1.0	< 1.0	0.57 J	< 1.0	0.63 J	0.91 J	1	1.8	5.6	4.0	18
Benzene	0.45	71-43-2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.5	< 1.0
Chloroform	0.22	67-66-3	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.32 J	< 1.0	< 1.0
cis-1,2-Dichloroethene	3.6	156-59-2	< 1.0	1.7	1.1	1.1	1.1	0.71 J	1.0	1.4	1.8	1.9	9.1	8.7
Tetrachloroethene	4.1	127-18-4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.60 J	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	36	156-60-5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	0.45 J	1.5
Trichloroethene	0.28	79-01-6	< 1.0	1.1	0.81 J	3.4	0.32 J	< 1.0	0.98 J	0.66 J	0.27 J	0.37 J	< 1.0	< 1.0
Vinyl Chloride	0.019	75-01-4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Notes:
Units are µg/L (ppb).
'--' denotes the constituent was not analyzed.
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.
* NO values available from 2015 data. Data given is most recent available
1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 7

Screening of Chemicals in Lower Sand and Gravel Groundwater - Off-Site Pristine Wells

GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	MW88 7/29/2015	MW89 7/29/2015	MW90* 8/13/2008	MW91 8/10/2015	MW92 7/30/2015	MW93 7/30/2015	MW94 8/3/2015	MW95 7/29/2015	MW96 7/24/2015	MW97 7/24/2015	MW98 7/27/2015	MW99 7/27/2015
1,1,1-Trichloroethane	200	71-55-6	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 3.3	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	0.041	79-00-5	< 1.0	< 1.0	< 2	< 1.0	< 1.0	< 1.0	< 1.0	2.1 J	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	2.7	75-34-3	0.59 J	0.42 J	< 2	< 1.0	5.3	< 1.0	0.90 J	3.2 J	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	7	75-35-4	< 1.0	< 1.0	--	< 1.0	1.5	< 1.0	< 1.0	< 3.3	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	0.0075	106-93-4	< 1.0	< 1.0	< 2	< 1.0	< 1.0	< 1.0	< 1.0	1.5 J	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	0.17	107-06-2	0.59 J	1.7	--	< 1.0	< 1.0	< 1.0	1.8	110	< 1.0	< 1.0	1.7	< 1.0
Benzene	0.45	71-43-2	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	2.9 J	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	0.22	67-66-3	< 1.0	< 1.0	< 2	< 1.0	< 1.0	< 1.0	< 1.0	< 3.3	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	3.6	156-59-2	1.1	4.9	3.5	0.61 J	25	< 1.0	0.39 J	6.3	< 1.0	< 1.0	6.5	1.8
Tetrachloroethene	4.1	127-18-4	< 1.0	< 1.0	--	< 1.0	< 1.0	< 1.0	< 1.0	< 3.3	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	36	156-60-5	0.43 J	1.3	--	< 1.0	1.7	< 1.0	< 1.0	< 3.3	< 1.0	< 1.0	0.39 J	0.39 J
Trichloroethene	0.28	79-01-6	< 1.0	1.8	--	0.59 J	< 1.0	< 1.0	< 1.0	1.9 J	< 1.0	< 1.0	9	< 1.0
Vinyl Chloride	0.019	75-01-4	< 1.0	< 1.0	--	0.44 J	6.2	0.84 J	< 1.0	2.2 J	< 1.0	< 1.0	1.9	< 1.0

Notes:
Units are µg/L (ppb).
'--' denotes the constituent was not analyzed.
'<' denotes the analyte was not detected above the indicated value.
Detected values above the applicable screening levels are highlighted in yellow.
* NO values available from 2015 data. Data given is most recent available
1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 8

Screening of Chemicals in Perched Zone Groundwater - On-Site Southern Perimeter Wells

GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	AF-12P 2/23/2010	AF-18P 6/17/2005	AF-2P 6/17/2015	AF-4P 6/15/2015	AF-5P 6/17/2015	AF-7P 6/18/2015	OSMW-10P 6/10/2015	PMW-3P 6/10/2015	TMW-1P 6/15/2015	TMW-2P 4/14/2011
1,1,1-Trichloroethane	200	71-55-6	< 1	< 0.01	2.5	47	83	< 1	25	37	160	< 1
1,1-Dichloroethane	2.7	75-34-3	< 1	< 0.01	7.8	6.5	9.3	2.9	31	71	63	< 1
1,1-Dichloroethene	7	75-35-4	< 1	< 0.01	< 1	2.6	5.2	< 1	< 2	< 5	18	< 1
1,2-Dichloroethane	0.17	107-06-2	< 1	< 0.01	< 1	< 1	< 1	< 1	< 2	< 5	0.22	< 1
Benzene	0.45	71-43-2	< 1	< 0.01	< 1	< 1	< 1	< 1	< 2	< 5	0.88	< 1
Chloroform	0.22	67-66-3	< 1	< 0.01	< 1	0.72	1.8	< 1	< 2	< 5	1.4	< 1
cis-1,2-Dichloroethene	3.6	156-59-2	< 1	< 0.01	< 1	2.8	8.1	1.4	26	180	58	< 1
Tetrachloroethene	4.1	127-18-4	< 1	< 0.01	< 1	10	1	< 1	< 2	< 5	1.2	< 1
trans-1,2-Dichloroethene	36	156-60-5	< 1	< 0.01	< 1	< 1	2.1	< 1	< 2	< 5	3.3	< 1
Trichloroethene	0.28	79-01-6	< 1	< 0.01	39	86	160	< 1	76	35	180	0.61
Vinyl Chloride	0.019	75-01-4	< 1	< 0.01	< 1	< 1	< 1	3.8	< 2	< 5	12	< 1

Notes:

Units are µg/L (ppb).

'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 9

Screening of Chemicals in Upper Sand and Gravel Groundwater - On-Site Southern Perimeter Wells

GE Aviation - Evendale, Ohio

Analyte	Applicable Screennng Level[1]	Location: Sample Date: CAS #	AF-11S 6/15/2015	AF-12S 3/12/2010	AF-2S 2/23/2010	AF-4S 6/15/2015	AF-5S 6/17/2015	AF-7S 6/18/2015	AF-8S 3/12/2010
1,1,1-Trichloroethane	200	71-55-6	2	< 1	3.2	< 1	< 1	< 10	< 1
1,1-Dichloroethane	2.7	75-34-3	21	5.2	14	< 1	5.2	< 10	0.71
1,1-Dichloroethene	7	75-35-4	2.2	1.5	1.7	< 1	< 1	< 10	< 1
Benzene	0.45	71-43-2	< 1	< 1	< 1	0.76	0.51	< 10	< 1
cis-1,2-Dichloroethene	3.6	156-59-2	160	39	58	< 1	3.5	510	< 1
Methylene Chloride	5	75-09-2	< 1	< 1	< 1	< 1	< 1	5.7	< 1
trans-1,2-Dichloroethene	36	156-60-5	4.4	0.92	1.4	< 1	< 1	< 10	< 1
Trichloroethene	0.28	79-01-6	48	< 1	43	< 1	< 1	< 10	< 1
Vinyl Chloride	0.019	75-01-4	2.4	58	38	< 1	26	480	14

Notes:

Units are µg/L (ppb).

'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 9

Screening of Chemicals in Upper Sand and Gravel Groundwater - On-Site Southern Perimeter Wells

GE Aviation - Evendale, Ohio

Analyte	Applicable Screennng Level[1]	Location: Sample Date: CAS #	AF-9S 6/17/2015	OSMW-10S 6/10/2015	OSMW-3S 6/17/2015	OSMW-4S 6/16/2015	PMW-3S 6/10/2015	TMW-1S 6/18/2015	TMW-2S 6/17/2015
1,1,1-Trichloroethane	200	71-55-6	< 1	17	< 1	< 1	2.8	< 1	< 1
1,1-Dichloroethane	2.7	75-34-3	1.1	7.3	< 1	< 1	4.9	< 1	< 1
1,1-Dichloroethene	7	75-35-4	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Benzene	0.45	71-43-2	< 1	< 1	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	3.6	156-59-2	3.2	27	< 1	< 1	34	4.5	< 1
Methylene Chloride	5	75-09-2	< 1	< 1	< 1	< 1	< 1	< 1	< 1
trans-1,2-Dichloroethene	36	156-60-5	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichloroethene	0.28	79-01-6	< 1	25	< 1	< 1	2.1	< 1	< 1
Vinyl Chloride	0.019	75-01-4	18	< 1	1.1	< 1	16	9.6	< 1

Notes:

Units are µg/L (ppb).

'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 10

Screening of Chemicals in Lower Sand and Gravel Groundwater - On-Site Southern Perimeter Wells

GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: / Sample Date: / CAS #	AF-11D 6/15/2015	AF-12D 10/10/2006	AF-18D 6/17/2005	AF-21D 6/17/2015	AF-5D 6/17/2015	AF-7D 6/18/2015	AF-8D 10/10/2006	AF-9D 12/8/2011
1,1,1-Trichloroethane	200	71-55-6	< 1	< 0.50	1.1	< 1	< 1	< 1	< 1.00	< 1
1,1-Dichloroethane	2.7	75-34-3	< 1	0.29	0.54	< 1	< 1	< 1	1.16	< 1
1,2-Dichloroethane	0.17	107-06-2	< 1	< 0.50	0.22	< 1	< 1	< 1	< 1.00	< 1
Benzene	0.45	71-43-2	< 1	< 0.50	< 0.01	< 1	< 1	< 1	0.76	< 1
cis-1,2-Dichloroethene	3.6	156-59-2	< 1	3.43	54	< 1	< 1	< 1	33.9	< 1
trans-1,2-Dichloroethene	36	156-60-5	< 1	< 0.50	6.6	< 1	< 1	< 1	12.4	< 1
Trichloroethene	0.28	79-01-6	< 1	< 0.50	3.7	< 1	< 1	< 1	< 1.00	< 1
Vinyl Chloride	0.019	75-01-4	< 1	2.9	< 0.01	< 1	< 1	< 1	65.8	< 1

Notes:

Units are µg/L (ppb).

'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 10

Screening of Chemicals in Lower Sand and Gravel Groundwater - On-Site Southern Perimeter Wells

GE Aviation - Evendale, Ohio

Analyte	Applicable Screening Level[1]	Location: Sample Date: CAS #	OSMW-10D 6/10/2015	OSMW-3D 6/17/2015	OSMW-4D 6/16/2015	PMW-2D 6/15/2015	PMW-3D 6/10/2015	TMW-1D 6/18/2015	TMW-2D 6/17/2015
1,1,1-Trichloroethane	200	71-55-6	< 1	< 1	< 1	< 1	< 1	< 1	< 10
1,1-Dichloroethane	2.7	75-34-3	< 1	2.2	4.3	< 1	3.1	< 1	< 10
1,2-Dichloroethane	0.17	107-06-2	< 1	< 1	< 1	< 1	< 1	< 1	< 10
Benzene	0.45	71-43-2	< 1	0.98	< 1	< 1	< 1	< 1	6.6
cis-1,2-Dichloroethene	3.6	156-59-2	< 1	11	8.8	< 1	15	< 1	870
trans-1,2-Dichloroethene	36	156-60-5	< 1	2.3	< 1	< 1	< 1	< 1	340
Trichloroethene	0.28	79-01-6	< 1	< 1	< 1	< 1	< 1	< 1	7.4
Vinyl Chloride	0.019	75-01-4	1.4	43	17	< 1	14	< 1	57

Notes:

Units are µg/L (ppb).

'<' denotes the analyte was not detected above the indicated value.

Detected values above the applicable screening levels are highlighted in yellow.

1) The applicable screening level is the lower of the USEPA Tapwater Regional Screening Level (RSL) or the Maximum Contaminant Level (MCL), as identified on the June 2015 RSL Summary Table (USEPA 2015).

Table 11
Summary of Chemicals of Potential Concern in Perched Zone, Upper Sand and Gravel and Lower Sand and Gravel Groundwater
GE Aviation - Evendale, Ohio

Constituent of Potential Concern	CAS #	Perched	USG	LSG
OFFSITE WELLS				
1,1,2-Trichloroethane	79-00-5			X
1,1-Dichloroethane	75-34-3	X	X	X
1,1-Dichloroethene	75-35-4		X	
1,2-Dichloroethane	107-06-2	X	X	X
1,2-Dibromoethane	106-93-4			X
Benzene	71-43-2		X	X
Chloroform	67-66-3		X	X
cis-1,2-Dichloroethene	156-59-2	X	X	X
Trichloroethene	79-01-6	X	X	X
Vinyl chloride	75-01-4	X	X	X
ONSITE PERIMETER WELLS				
1,1-Dichloroethane	75-34-3	X	X	
1,1-Dichloroethene	75-35-4	X		
1,2-Dichloroethane	107-06-2	X		X
Benzene	71-43-2	X	X	X
Chloroform	67-66-3	X		
cis-1,2-Dichloroethene	156-59-2	X	X	X
Methylene chloride	75-09-2		X	
Tetrachloroethene	127-18-4	X		
Trichloroethene	79-01-6	X	X	X
trans-1,2-Dichloroethene	156-60-5			X
Vinyl Chloride	75-01-4	X	X	X

X = COPC exceeds screening criteria in identified water-bearing unit

Table 12
Summary of Maximum Historical and 2015 COPC Concentrations
GE Aviation - Evendale, Ohio

	Regulatory Criteria			Perched			USG			LSG		
Constituent of Potential Concern	USEPA Tap Water RSL[1]	USEPA MCL[2]	Mill Creek Water Quality Criteria[3]	Maximum Historical Concentration (µg/L)	Maximum 2015 Concentration (µg/L)	% Reduction	Maximum Historical Concentration (µg/L)	Maximum 2015 Concentration (µg/L)	% Reduction	Maximum Historical Concentration (µg/L)	Maximum 2015 Concentration (µg/L)	% Reduction
GE-AFP36 WELLS												
1,1,1-Trichloroethane[4]	800	200	NA	1760	430	76	480	29	94	230	0	100
1,1,2-Trichloroethane	0.041	5	420	3.1	0.49	84	0.7	0	100	0.67	0	100
1,1-Dichloroethane	2.7	NA	NA	250	130	48	3600	21	99	490	5.2	99
1,1-Dichloroethene	28	7	32	230	67	71	100	4.5	96	26	0.68	97
1,2-Dichloroethane	0.17	5	990	7	0.22	97	4.7	0	100	0.65	0	100
Benzene	0.45	5	710	7	0.88	87	2.25	0.76	66	8	6.6	18
Chloroform	0.22	80	4700	5.5	2.7	51	6.6	0	100	17	0	100
cis-1,2-Dichloroethene	3.6	70	NA	590	230	61	2679	650	76	870	870	0
Methylene chloride	11	5	16000	27	2.1	92	49	5.7	88	11	4.9	55
Tetrachloroethene	4.1	5	89	52	11	79	9	0	100	1	0	100
trans-1,2-Dichloroethene	36	100	140,000	76	35	54	1000	4.4	100	340	340	0
Trichloroethene	0.28	5	810	2200	440	80	1700	48	97	1000	270	73
Vinyl Chloride	0.019	2	5300	345	20	94	920	650	29	290	57	80

Notes:
Units are in µg/L

1 - USEPA Tapwater Regional Screening Level (RSL) as identified on the November 2015 RSL Summary Table (USEPA 2015)

2 - USEPA Maximum Contaminant Level (MCL) as identified on the November 2015 RSL Summary Table (USEPA 2015)

3 - OEPA (3745-1-34) Non-Drinking Water Quality Criteria for the Ohio River drainage basin

4 - 1,1,1-Trichloroethane included as COPC due to its broad distribution and historical concentrations in the Facility Perched zone monitoring wells

% Reduction is 2015 Maximum Value compared with Historical Maximum Value

Table 13

Perched Zone - Modeling and Historical Monitoring Results for Key CVOCs and Performance Monitoring Wells

GE Aviation - Evendale, Ohio

Constituent of Potential Concern	Regulatory Criteria	Calibrated Model 840 feet to Mill Creek			Back-Calculated Model 840 feet to Mill Creek (Cal. λ)			Modified Back-Calculated Model 840 feet to Mill Creek (λ/2)			2015 Maximum Observed			Proposed CMOs
	Mill Creek Water Quality Criteria[1]	(λ) Decay Coefficient (1/yr)	AF-7P ("Source")	OSMW-10P (Perimeter)	(λ) Decay Coefficient (1/yr)	AF-7P ("Source")	OSMW-10P (Perimeter)	(λ) Decay Coefficient (1/yr)	AF-7P ("Source")	OSMW-10P (Perimeter)	AF-7P	OSMW-10P	Perched Extraction Wells Influent	
1,1-Dichloroethene	32	38.54	165	**8**	38.54	165	**48**	19.27	165	**39**	*0*	*0.76*	*16*	**39**
Trichloroethene	810	2.08	1140	**200**	2.08	6542	**1150**	1.04	3910	**920**	*0*	*81*	*240*	**920**
Vinyl Chloride	5300	39.48	0.0	**6**	39.48	0	**32**	19.74	0	**25**	*3.9*	*0*	*12*	**25**

Units are in µg/L

1 - OEPA (3745-1-34) Non-Drinking Water Quality Criteria for the Ohio River drainage basin

Table 14

USG - Modeling (LSG) and Historical Monitoring Results for Key CVOCs and Performance Monitoring Wells

GE Aviation - Evendale, Ohio

Constituent of Potential Concern	Regulatory Criteria	Calibrated Model			Back-Calculated Model (Cal. λ)			Modified Back-Calculated Model (λ/2)			2015 Maximum Observed			Proposed CMOs
	USEPA MCL[1]	(λ) Decay Coefficient (1/yr)	PMW-3D ("Source")	OSMW-3D (Perimeter)	(λ) Decay Coefficient (1/yr)	PMW-3D ("Source")	OSMW-3D (Perimeter)	(λ) Decay Coefficient (1/yr)	PMW-3D ("Source")	OSMW-3D (Perimeter)	AF-11S	OSMW-4S	USG EW 7S Influent	
cis-1,2-Dichloroethene	70	16	8500	**240**	16	8500	**1500**	8	4500	**155**	*160*	*0*	*210*	**155**
Trichloroethene	5	25	21000	**460**	25	5.92E+05	**13000**	12.5	11000	**260**	*0*	*0*	*0*	**260**
Vinyl Chloride	2	5	0.0	**950**	5	0.0	**1800**	2.5	0.0	**50**	*3.2*	*1.6*	*320*	**50**

Notes:

Units are in µg/L

1 - USEPA Maximum Contaminant Level (MCL) as identified on the November 2015 RSL Summary Table (USEPA 2015)

Table 15

LSG - Modeling and Historical Monitoring Results for Key CVOCs and Performance Monitoring Wells

GE Aviation - Evendale, Ohio

Constituent of Potential Concern	Regulatory Criteria	Calibrated Model			Back-Calculated Model (Cal. λ)			Modified Back-Calculated Model (λ/2)			2015 Maximum Observed					Proposed CMOs
	USEPA MCL[1]	(λ) Decay Coefficient (1/yr)	PMW-3D ("Source")	OSMW-3D (Perimeter)	(λ) Decay Coefficient (1/yr)	PMW-3D ("Source")	OSMW-3D (Perimeter)	(λ) Decay Coefficient (1/yr)	PMW-3D ("Source")	OSMW-3D (Perimeter)	PMW-3D	OSMW-3D	OSMW-4D	LSG EW-3D Influent	LSG EW-8D Influent	
cis-1,2-Dichloroethene	70	16	8500	**240**	16	8500	**1500**	8	4500	**155**	*25*	*410*	*16*	*160*	*6*	**155**
Trichloroethene	5	25	21000	**460**	25	5.92E+05	**13000**	12.5	11000	**260**	*1.2*	*270*	*0*	*220*	*0*	**260**
Vinyl Chloride	2	5	0.0	**950**	5	0.0	**1800**	2.5	0.0	**50**	*25*	*43*	*24*	*4*	*7*	**50**

Notes:

Units are in µg/L

1 - USEPA Maximum Contaminant Level (MCL) as identified on the November 2015 RSL Summary Table (USEPA 2015)

Table 16

Preliminary Groundwater CMOs for Key CVOCs in Perched Zone, USG and LSG

GE Aviation - Evendale, Ohio

Constituent of Potential Concern	Regulatory Criteria		Perched Zone GW CMOs	USG GW CMOs	LSG GW CMOs
	USEPA MCL[1]	Mill Creek Water Quality Criteria[2]			
1,1-Dichloroethene	NA	32	39	NA	NA
cis-1,2-Dichloroethene	70	NA	NA	155	155
Trichloroethene	5	810	920	260	260
Vinyl Chloride	2	5300	25	50	50

Notes:

Units are in µg/L

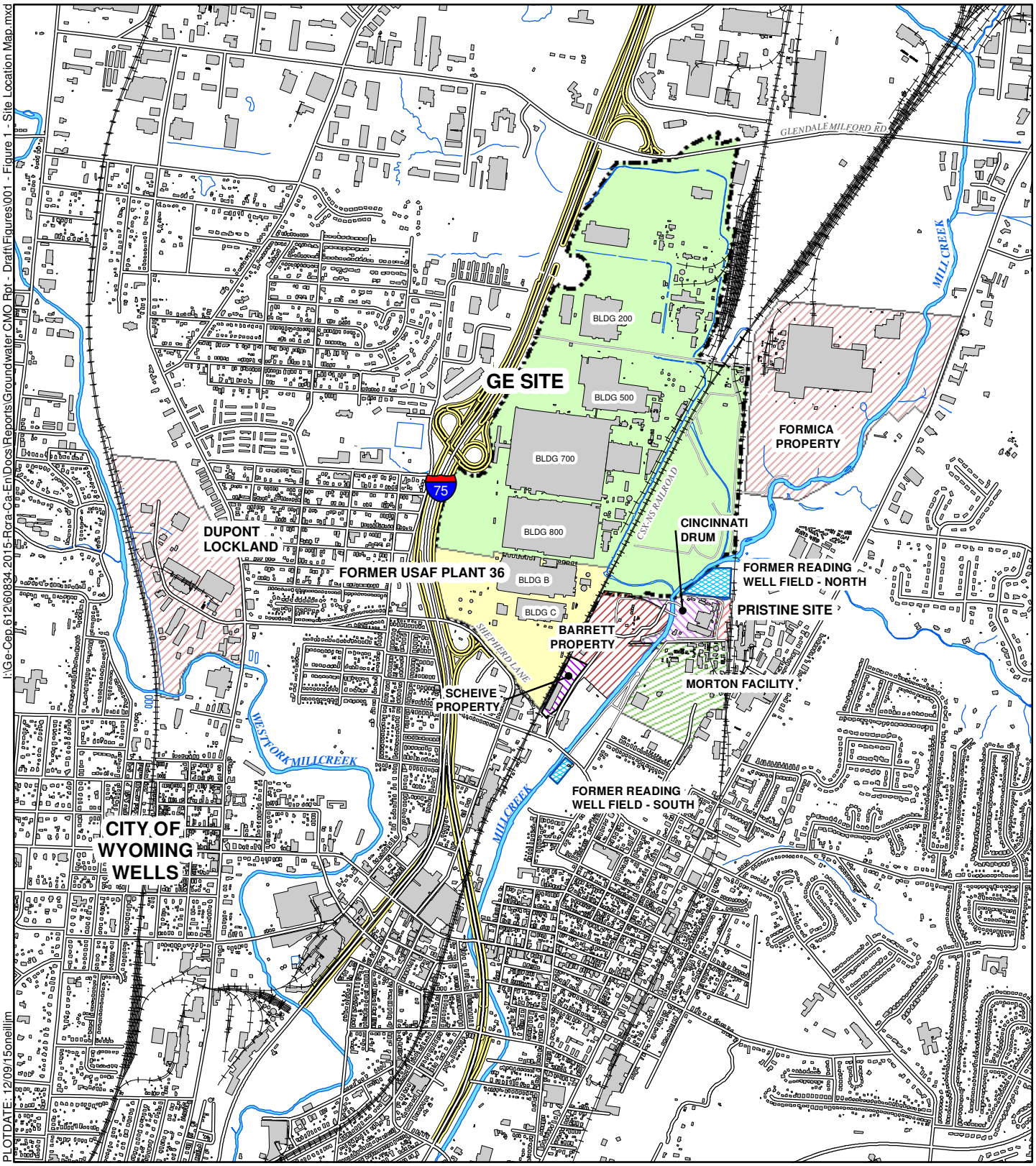
1 - USEPA Maximum Contaminant Level (MCL) as identified on the November 2015 RSL Summary Table (USEPA 2015)

2 - OEPA (3745-1-34) Non-Drinking Water Quality Criteria for the Ohio River drainage basin

NA = Not Applicable

Figures

FIGURE 1



GE AVIATION
EVENDALE, OHIO

SITE LOCATION MAP

0 1,000 2,000 4,000
Feet

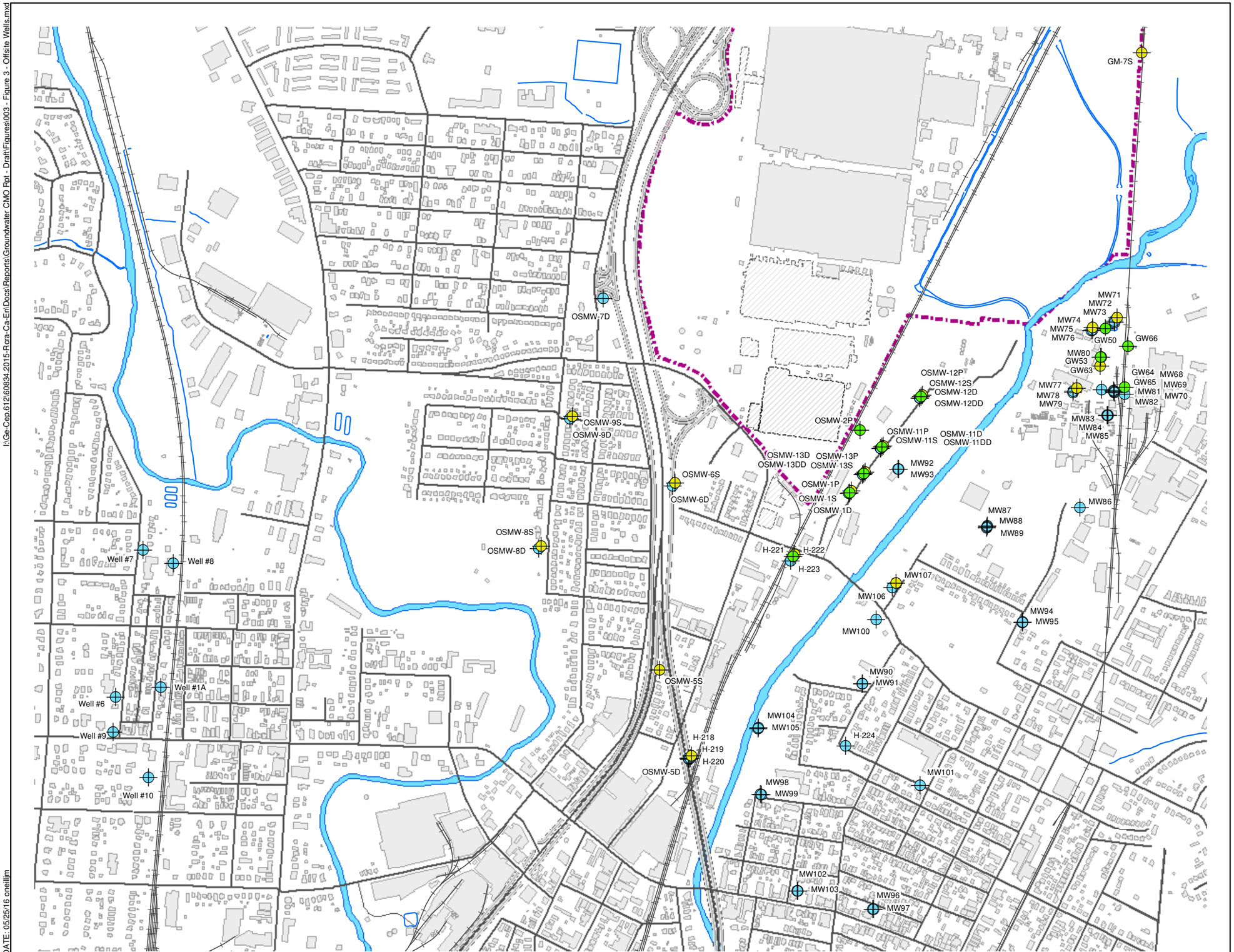
N

O'BRIEN & GERE ENGINEERS, INC.

Figure 2
Human Health and Ecological Conceptual Site Model
GE Aviation Evendale Facility
Evendale, Ohio

Chemical Source	Migration Pathways	Exposure/ Transport Media	Exposure Routes	Potential Human Receptors							Potential Ecological Receptors	
				On-Site Receptors				Off-Site Receptors			Mill Creek Receptors	
				Outdoor Industrial Worker	Utility Worker	Construction Worker	Indoor Industrial Worker	Child Resident	Adult Resident	Creek User	Community-Level Biota (Benthic Macroinvertebrates, Fish)	Wildlife (Semi-Aquatic Birds, Mammals)
				Current / Future	Current / Future	Current / Future	Current / Future	Current / Future	Current / Future	Current / Future		
				>18 years old	>18 years old	>18 years old	>18 years old	0-6 years old	>18 years old	> 6 years old		
GE Aviation Evendale Facility - Historical Operations	Infiltration/ Percolation	Soil										
		Volatilization ↑ / Leaching ↓										
		Shallow Groundwater (Perched Zone)	Ingestion	◊	Δ	◊	◊	●	●	●	◊	◊
			Dermal Contact	◊	●	◊	◊	●	●	●	◊	◊
			Ambient Inhalation of Vapors	◊	●	◊	◊	Δ	Δ	Δ	◊	◊
			Indoor Inhalation of Vapors	◊	◊	◊	●	●	●	●	◊	◊
		GW Flow ↑ / GW Flow ↓										
	Subsurface Release	Deep Groundwater (USG, LSG)	Ingestion	◊	◊	◊	◊	●	●	●	◊	◊
			Dermal Contact	◊	◊	◊	◊	●	●	●	◊	◊
			Ambient Inhalation of Vapors	◊	◊	◊	◊	◊	◊	◊	◊	◊
			Indoor Inhalation of Vapors	◊	◊	◊	◊	●	●	●	◊	◊
		Mill Creek Sediment/Surface Water	Incidental Ingestion	◊	◊	◊	◊	◊	◊	●	Δ	●
			Dermal Contact	◊	◊	◊	◊	◊	◊	Δ	●	Δ
			Ambient Inhalation of Vapors	◊	◊	◊	◊	◊	◊	Δ	◊	◊
			Ingestion of Biological Tissue	◊	◊	◊	◊	◊	◊	Δ	●	●

Notes:
● : Potentially complete exposure pathway.
Δ : Pathway is considered to represent *de minimis* exposure.
◊ : Incomplete exposure pathway.



N

LEGEND

- GE Property Boundary
- Perched Aquifer Monitoring Well Location
- USG Aquifer Monitoring Well Location
- LSG Aquifer Monitoring Well Location
- Existing Building
- Former Building
- *800* Building ID

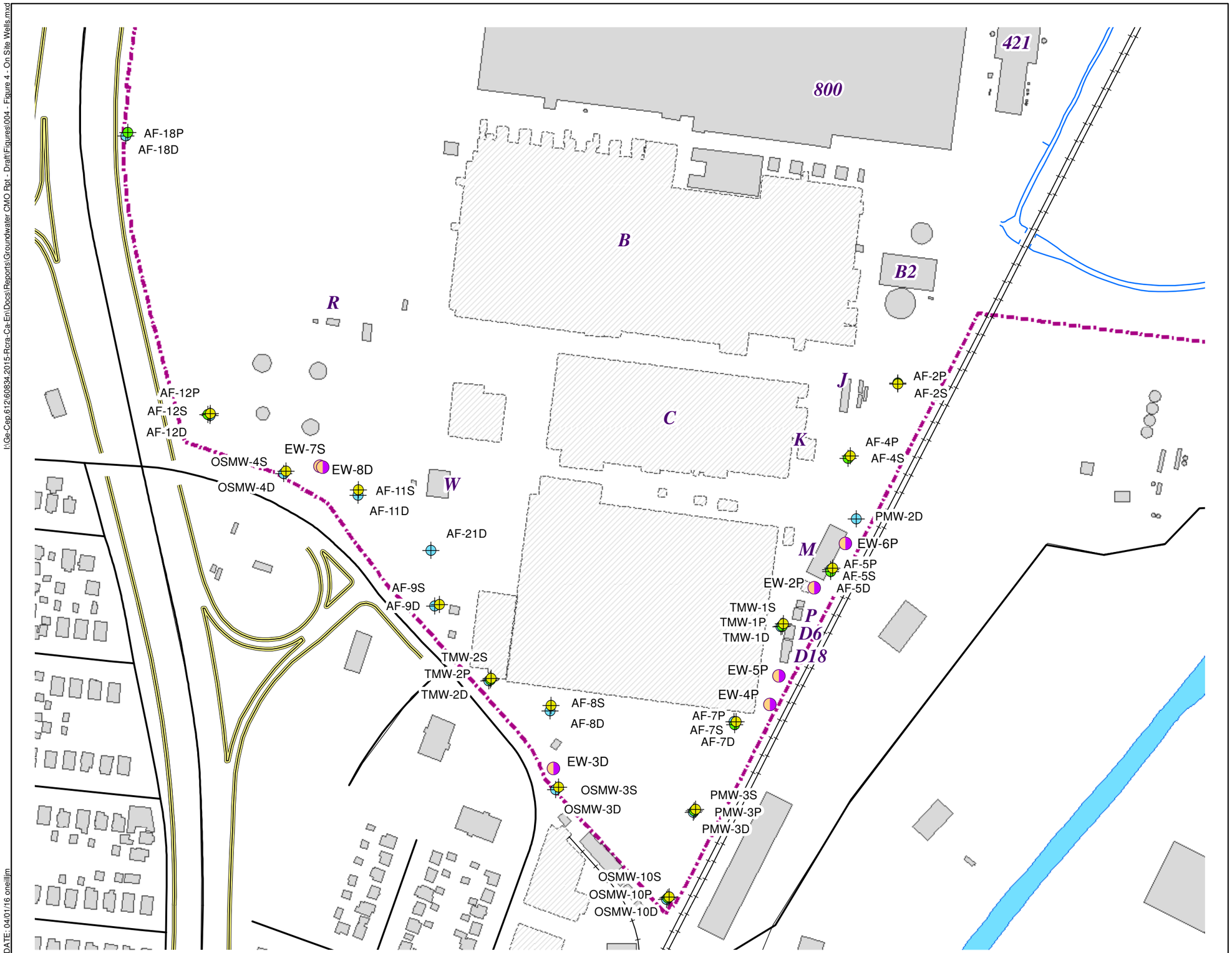
GE AVIATION
EVENDALE, OHIO

OFF SITE MONITORING WELLS

0 200 400 800
Feet

612-STDS-GW
NOVEMBER 2015

O'BRIEN & GERE ENGINEERS, INC.



N

LEGEND

- GE Property Boundary
- Perched Aquifer Monitoring Well Location
- USG Aquifer Monitoring Well Location
- LSG Aquifer Monitoring Well Location
- Extraction Well Location
- Existing Building
- Former Building
- 800 Building ID

GE AVIATION
EVENDALE, OHIO

ON SITE MONITORING WELLS (South Perimeter Wells)

0 100 200 400
Feet

612-60834-GW
DECEMBER 2015

O'BRIEN & GERE ENGINEERS, INC.

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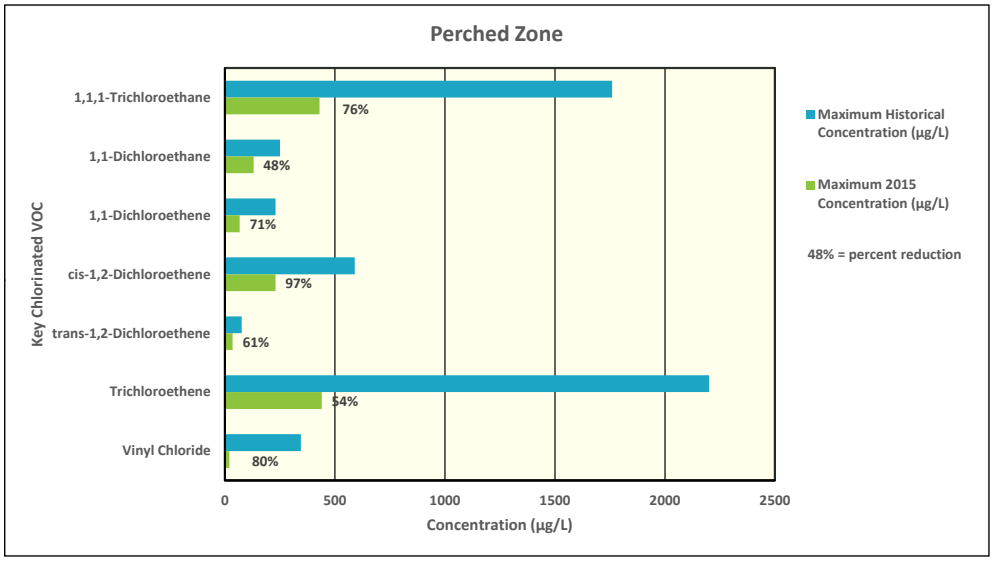
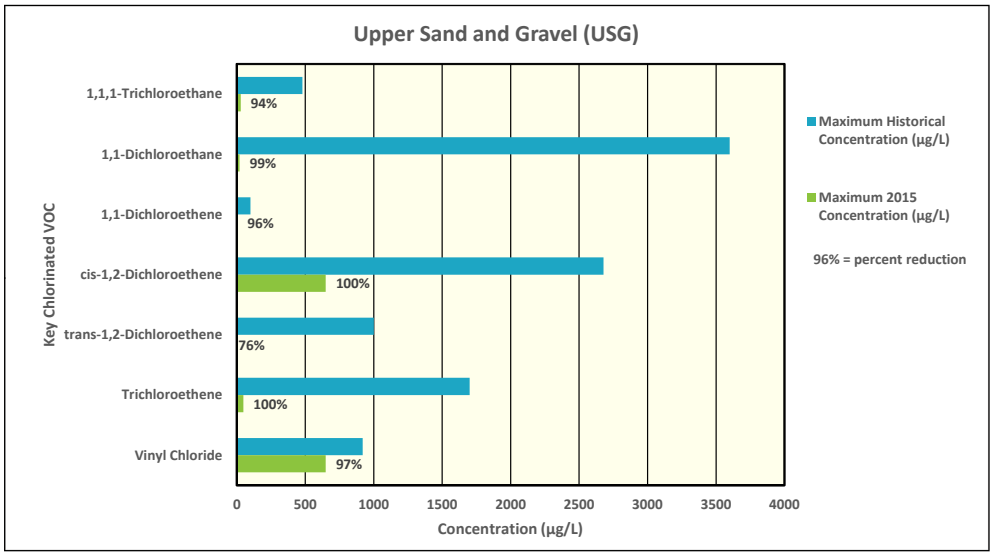
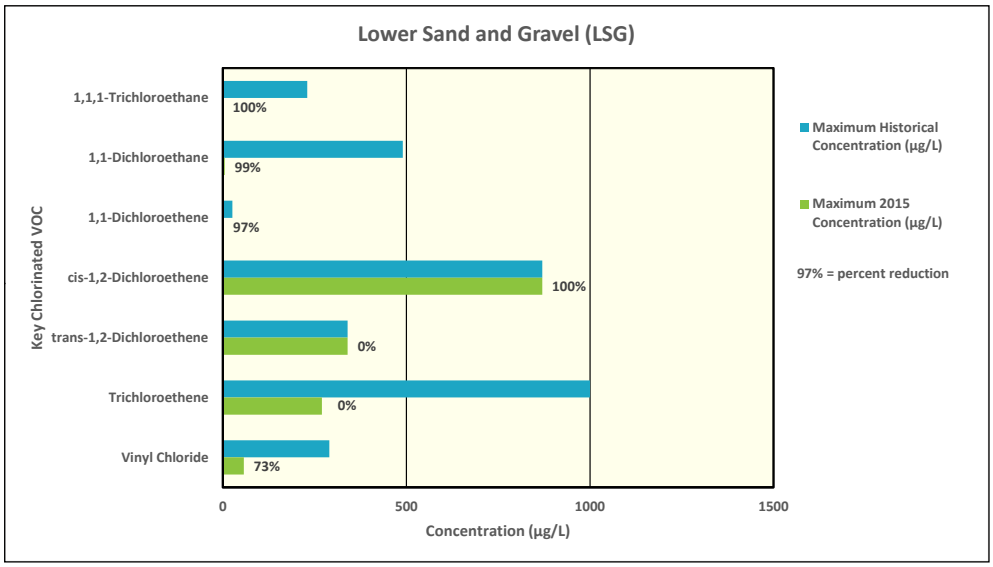
PLOTDATE: 04/01/16 oneillin

FIGURE 5







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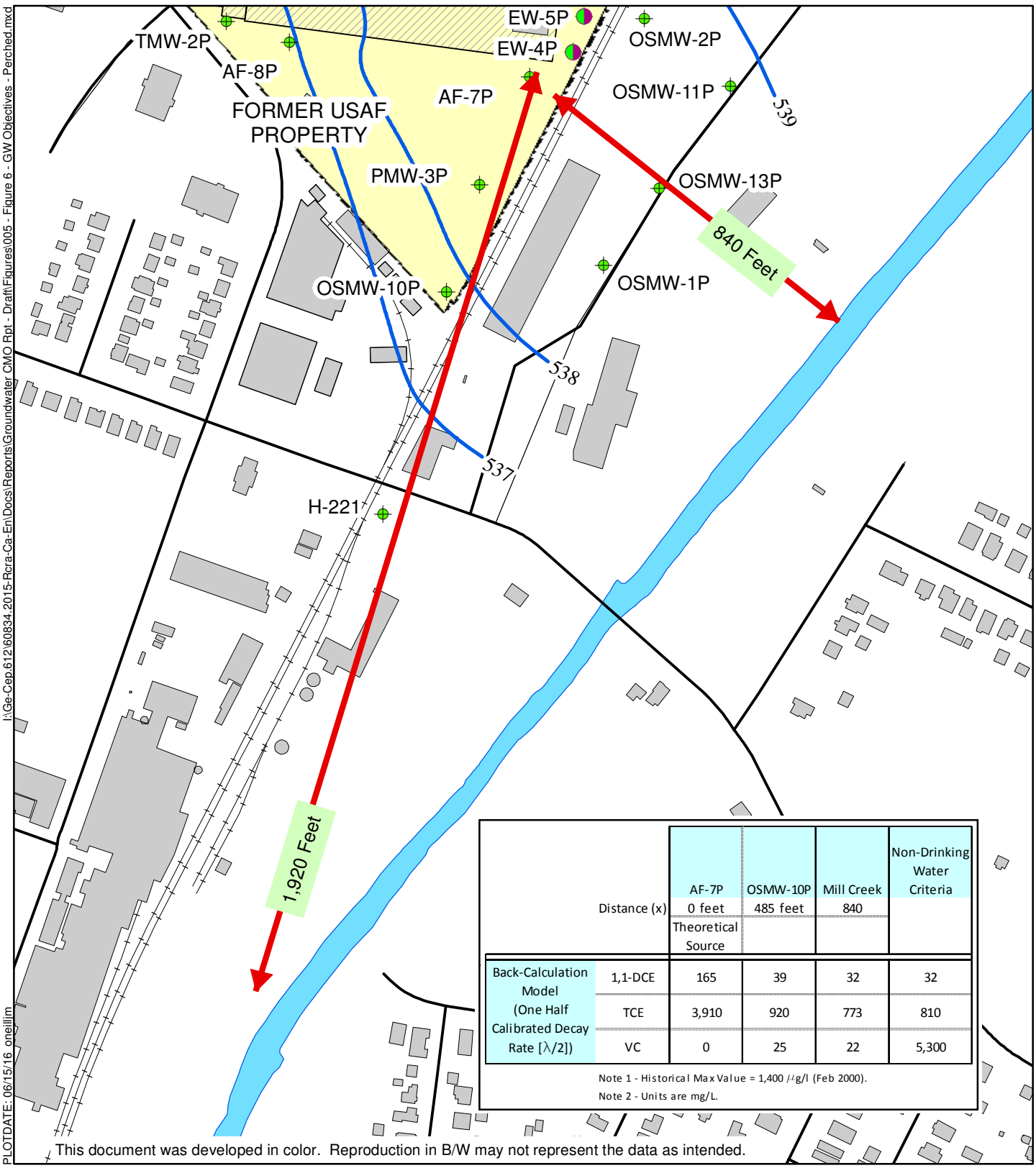
PLOTDATE: 07/14/16Oneilljm

GE AVIATION
EVENDALE, OHIO

REDUCTION IN KEY CVOC CONCENTRATIONS PERCHED, USG, and LSG

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 6



		Distance (x)	AF-7P 0 feet Theoretical Source	OSMW-10P 485 feet	Mill Creek 840	Non-Drinking Water Criteria
Back-Calculation Model (One Half Calibrated Decay Rate [λ/2])	1,1-DCE		165	39	32	32
	TCE		3,910	920	773	810
	VC		0	25	22	5,300

Note 1 - Historical Max Value = 1,400 µg/l (Feb 2000).
Note 2 - Units are mg/L.

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PLOTDATE: 06/15/16 oneillim

LEGEND

- PERCHED MONITORING WELL LOCATION
- PERCHED EXTRACTION WELL LOCATION
- GROUNDWATER CONTOUR (JULY 2015)

GE AVIATION
EVENDALE, OHIO

CONCEPTUAL DEVELOPMENT OF GROUNDWATER CONCENTRATION OBJECTIVES PERCHED ZONE

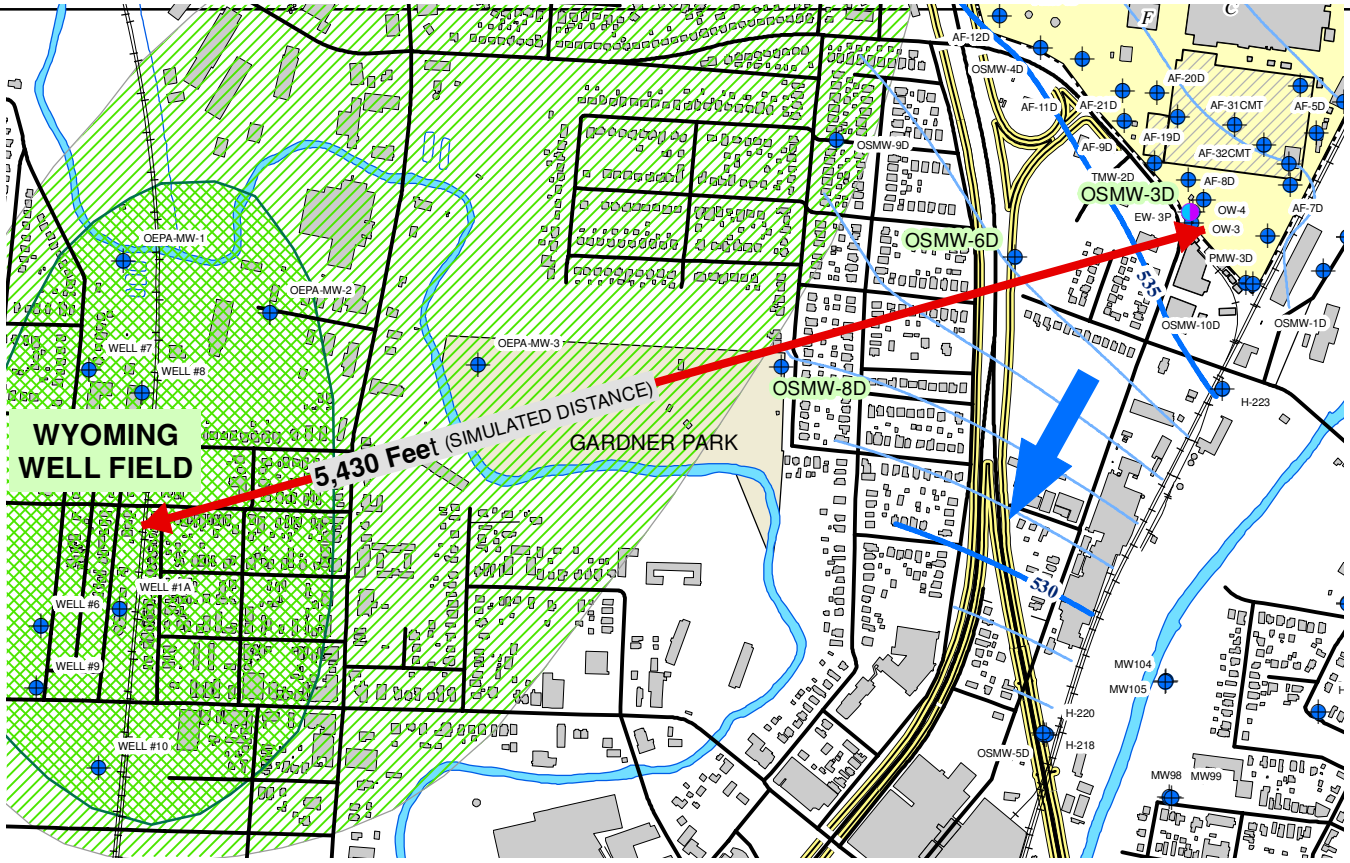
612/60834/005
DECEMBER 2015

0 200 400 800
Feet

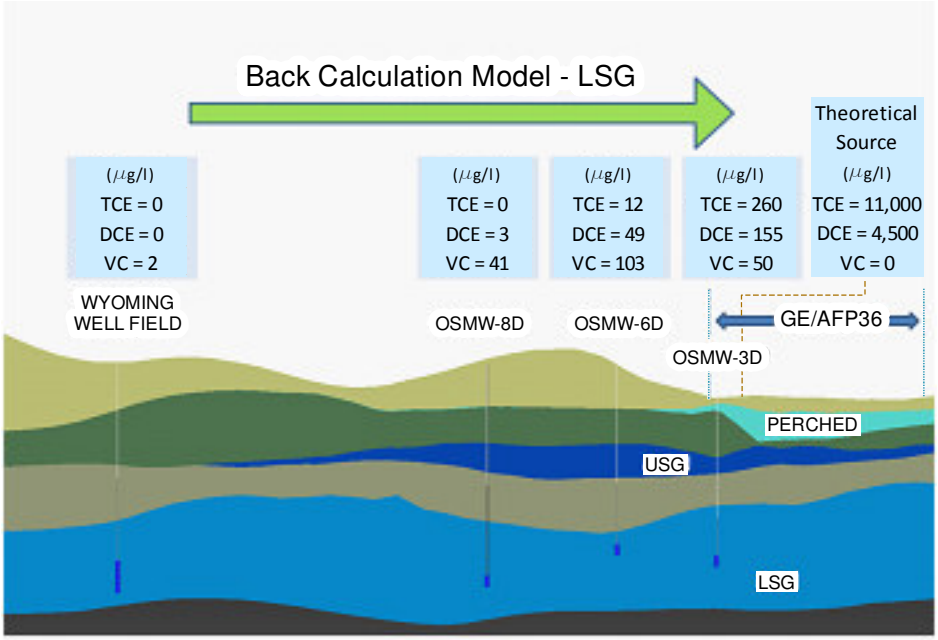
N

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 7



Back Calculation Model
(One Half Calibrated Decay Rate)



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LEGEND

- LSG WELL LOCATION
- LSG EXTRACTION WELL LOCATION
- GROUND WATER CONTOUR (July 2015)
- WYOMING WELLFIELD 1 YR. TIME OF TRAVEL ZONE
- WYOMING WELLFIELD 5 YR. TIME OF TRAVEL ZONE
- INTERPRETED GROUNDWATER FLOW PATH

GE AVIATION
EVENDALE, OHIO

CONCEPTUAL DEVELOPMENT GROUNDWATER CONCENTRATION OBJECTIVES LSG

612/60834/005
DECEMBER 2015

0 600 1,200 2,400
Feet

N

O'BRIEN & GERE ENGINEERS, INC.

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PLOTDATE: 06/14/16 oneillim

Appendix A – Evaluation of Groundwater Use in the GE Evendale Study Area

APPENDIX A
EVALUATION OF GROUNDWATER USE
GE AVIATION – EVENDALE, OH

This Appendix has been developed by GE to assist U.S. EPA in designating groundwater use beneath and within the vicinity of the GE facility in Evendale, Ohio. The groundwater use designation is a determination of the (1) reasonably expected use(s), (2) resource value (i.e., priority), and/or (3) groundwater vulnerability in a certain area (USEPA, 2004). The following supporting information has been developed to address these primary criteria based on a review of Federal and State groundwater classification or designation, as well as water use and quality designation for the Mill Creek. The following information sources were considered in assessing use, value, and vulnerability:

- *Background – Hydrogeologic Conditions*
- *Federal Groundwater Classification and Sole-Source Aquifer Designation*
- *State and Local Groundwater Use Designation*;
- *Susceptibility Analysis and Impacted Regional Groundwater*
- *Existing Institutional Controls*
- *Surface Water Use and Quality Designation – Mill Creek*

These categories are interrelated and are addressed in the following subsections below.

BACKGROUND

Subsurface conditions beneath the Facility and surrounding area consist of a bedrock valley filled with 90 to 200 feet of poorly-graded permeable outwash sand and gravel interbedded with layers of silt, clay, and glacial till (Spieker, 1961; Fidler, 1970). Significant flow zones include the semi-confined lower or deep zone (*i.e.*, Lower Sand and Gravel [LSG]) and an upper or shallow zone which includes clays and silts of variable extent and thickness, further subdivided into the Upper Sand and Gravel (USG) and the Perched zone. The sand and gravel deposits within the Perched zone are limited in extent and are generally not considered an aquifer for potable use. The USG is thin and areally limited as compared to the LSG and therefore provides lower yields to wells, as compared to the LSG.

Historically, nearly all of the groundwater pumped in the Mill Creek Valley has been from the LSG, being used for industrial and municipal purposes, with residential use comparatively insignificant (Fidler, 1970; Schalk and Schumann, 2002). A potable well survey was conducted in 2013, and with the exception of the City of Wyoming well field, no potable uses of groundwater were identified within approximately 2 miles south of the Facility. A location map and tabulated summary of well survey results are attached as Figure A-1 and Table A-1. The City of Wyoming continues to operate a well field that pumps approximately 1 million gallons per day (mgd), located approximately one mile to the southwest of the Facility. Vinyl chloride (VC) has been detected at certain wells of the Wyoming well field at low concentrations (4 ppb or less), but not detected in the treated water supply. Monthly sampling of the Wyoming Wells for VOC analysis was conducted by GE, beginning in September 2007 and continued until November 2010. Although VC has not been detected in the treated groundwater supply, GE worked with the City of Wyoming Water Department and Ohio EPA in the design and construction of a supplemental air stripping unit as a precaution to remove VOCs that may be present in the raw groundwater. In 2011, the air stripper became operational, providing an extra layer of protection for the removal of potential VOCs before the treated drinking water is discharged to the water distribution system (City of Wyoming, 2010).

Due to the presence of Perched/USG and USG/LSG vertical hydraulic communication areas, the entire unconsolidated aquifer of this area of the Mill Creek Valley is considered a current or potential future source of drinking water. Although the unconsolidated aquifer is considered a current or potential future source of drinking

water, the following conditions will inhibit restoration of water quality in the near term:

- There is regional contamination (i.e., comingled plumes) from sources outside of the Facility.
- The likelihood of Perched zone and USG groundwater use within next 30 years is low, considering the proximity to an existing public water supply.
- The aquifer is highly heterogeneous, with CVOC-impacted fine-grained materials occurring within identified zones of flow, with groundwater restoration inhibited by back-diffusion of CVOCs from residual sources in less permeable strata.

FEDERAL AND STATE GROUNDWATER CLASSIFICATION AND SOLE-SOURCE AQUIFER DESIGNATION

The Great Miami Buried Valley Aquifer System underlies most or parts of 13 counties in Southwest Ohio and was designated by USEPA as a Sole Source Aquifer in 1988, identifying this system as an irreplaceable resource as the sole or primary source of drinking water (OKI, 2014). However, the Mill Creek Basin, as part of the Great Miami aquifer system in Butler and Hamilton Counties, was excluded from this designation since the population in this basin depends primarily on surface water for its drinking water supply. Based on the primary reliance on surface water for drinking water supply in the Mill Creek Valley (and in the study area of the Facility in particular), the groundwater is considered to be classified as a Class IIA (currently used – *i.e.*, LSG) or Class IIB (potential use – *i.e.*, Perched and USG).

Using the Ohio Voluntary Action Program (VAP) groundwater classification system, the LSG would be designated a Critical Resource aquifer (similar to USEPA Class I aquifer) due to its yield and location in a drinking water source protection area for a public water system using groundwater. The Perched zone and USG would be designated Class A groundwater (similar to USEPA Class II aquifer) based on groundwater yield and quality.

SUSCEPTIBILITY ANALYSIS AND IMPACTED REGIONAL GROUNDWATER

Ohio EPA's Source Water Assessment and Protection Program (SWAP) assists public water suppliers in protecting surface and groundwater sources of drinking water from contamination. The City of Wyoming has completed a source water assessment. The source water protection area is shown in Figure A-2, based on 1-year and 5-year time of groundwater travel to the wellfield. As shown on Figure A-2, the source water protection area extends from the Wyoming Well Field north-northeast toward I-75 but does not include the GE Facility.

The susceptibility analysis conducted as part of SWAP is an evaluation of the likelihood that a drinking water source could become contaminated. A susceptibility rating of moderate to high is identified for the Mill Creek valley aquifer in the vicinity of the Facility (ODNR, 1989; Wyoming Water Works, 2011; Ohio EPA, 2012). Ohio EPA's high susceptibility rating is largely a function of the history and nature of industrial activity in this area of the Mill Creek Valley that has resulted in diminished ambient groundwater quality in the surrounding area of the Facility.

No restrictions exist on the installation of private drinking water wells within a source water protection area within the State of Ohio. State and county requirements exist for the permitting, sampling, and abandonment of private water wells. However, as discussed further below, while individual applications for well installation permits require approval, there is no system to broadly restrict private well installation or track permit denials via property deeds.

The Ohio Voluntary Action Program (VAP) allows for the consideration of an Urban Setting Designation (USD) under certain conditions to provide for cleanup of impacted properties. A USD recognizes that groundwater cleanup to drinking water standards is unnecessary because impacted groundwater poses no perceptible human health risk, since the groundwater is not being used, and will not be used, for drinking water purposes in the foreseeable future. While GE is not eligible for the Ohio VAP due to RCRA Corrective Action requirements, GE intends to apply the USD concepts and criteria to support the groundwater use designation and development of CMOs. The USD threshold criteria are based on population, connection to community water systems, the location of SWAP protection area(s), and the absence of potable water wells within one-half mile (Ohio EPA, May 2009).

Preliminary findings that support the conceptual application of a USD within one mile of the Facility southern boundary is provided in Table A-2 and Figure A-3.

EXISTING INSTITUTIONAL CONTROLS

Institutional controls (ICs) are non-engineered measures such as administrative and/or legal controls implemented to minimize the potential for human or ecological exposure to constituents of potential concern (COPCs) by limiting land or resource use (USEPA, 2004). An evaluation of existing ICs in the form of a local groundwater use ordinance was conducted as an initial step in developing ICs as part of the RCRA Corrective Action Program at the Facility. The evaluation included a review of existing groundwater well information, review of local ordinances and discussions with local government personnel. A summary of the findings regarding existing ICs include:

- local municipalities in proximity to the Facility do not have ordinances in place prohibiting the installation of private water systems; and
- residential water systems are permitted through the Hamilton County Department of Public Health through an application process. Rejected permits are not filed with property deeds.

GE will provide the Hamilton County Public Health Division of Water Quality with a map of potentially affected groundwater so they can control future well installation permit applications based on current conditions in the affected areas. As an additional protective measure, GE will conduct periodic reviews of public records and provide annual documentation of the review results.

SURFACE WATER USE AND QUALITY DESIGNATION – MILL CREEK

In Southwest Ohio, drinking water is obtained from both groundwater and surface water sources (OKI, 2014). Watersheds in Hamilton County, including Mill Creek, have been designated by Ohio EPA as both an industrial water supply and an agricultural water supply. The Mill Creek, however, is not designated as a public water supply. In general, the Mill Creek watershed is identified as a Class B Primary Contact Recreational Watershed, which supports or has the potential to support, occasional full-body contact recreation activities (*e.g.*, wading, kayaking). However, the portion of the Mill Creek adjacent and downstream of the Facility, in particular, the nearby East and West Forks of the Mill Creek, have been designated as Class B Secondary Contact Recreational. This recreational use designation includes waters that result in minimal exposure potential to water-borne pathogens due to rare use and insufficient depths for total body immersion (Ohio EPA, 2014; OKI, 2014).

Ohio EPA water quality assessment (Ohio EPA, 2014) designates the portion of Mill Creek surrounding the Facility as a non-attainment warm water habitat that is impaired by several sources, such as urban runoff, industrial discharge, combined sewer overflows, municipal discharge, and streambank modification. Indices for biotic integrity and well-being are assessed as fair to very poor. Fish tissue samples from historical studies have resulted in the placement of this reach of the Mill Creek on an advisory list for human consumption of fish sourced from this water due to constituents other than VOCs (Ohio EPA, 2014).

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Tables

Table A-1
Summary of Well Survey Results
GE Aviation - Evendale, Ohio

ODNR ID	ODNR ID (Text)	Alternate Well ID	Owner		Well Use	Pump Installed	Diameter (inches)	Screen Bottom (ft bgs)	Well Depth (ft bgs)	Approximate Distance from GE Property (ft)	Direction from GE Site	Well Log	House Number	Street Name	County	Township	Latitude	Longitude	Y_coord	X_Coord	Case Length	Screen Length	Slot Size	Test Rate	Static Water Level	Aquifer Type	Date Installed
100510	a100510	Log #100510	Huddlestar	JP	Private	yes	5		100			yes							457414	1422605							6/14/1952
100533	a100533		HUDDLESTAR	J	Private	yes	5		100			yes		COOPER	HAMILTON	SYCAMORE	39.234369	-84.413208	455317.3	1426624.6				1		SHELLS LIME SAND	11/23/1952
1011908	a1011908		GETTINS		Geothermal	no			75			yes	218	WORTHINGTON	HAMILTON	SPRINGFIELD	39.2256	-84.4688	452462.4	1410812.7						GRAVEL	8/4/2009
101817	a101817	Log #101817(9)	FORMICA CORP.		Industry	yes	12	191	191			yes	10155	READING	HAMILTON	SYCAMORE	39.248404	-84.432197	460540.6	1421356.2	151	40		600	101	SAND	3/25/1958
110167	a110167	Log #110167	Johnson	Oscar	Private		6		75			yes							457409	1422610							9/3/1953
110168	a110168	Log #110168	Sanney	Al	Private		6		76			yes							457409	1422605							9/5/1953
119294	a119294		VANDERHAAR BROS.		Industry		6		52			yes		COOPER	HAMILTON	SYCAMORE	39.237469	-84.419516	456484.1	1424861.6					19	SAND & GRAVEL	3/17/1955
119295	a119295		VANDERHAAR BROS.		Industry		6		56			yes		COOPER	HAMILTON	SYCAMORE	39.237469	-84.419516	456484.1	1424861.6	46	10			19	SAND & GRAVEL	---
142764	a142764	Log #142764(9)	FORMICA CORP.		Industry	yes	12	201	201	1095		yes							457463	1421117	181	20		495	106	SAND & GRAVEL	12/29/1954
142775	a142775		THE LIQUID CARBONIC		Industry	yes	8	161	161			yes		READING	HAMILTON	SYCAMORE	39.210583	-84.447813	446864.2	1416639.5	141	20		60	110	SAND & GRAVEL	8/22/1955
151087	a151087	Log #151087	Duyyer	George	Private	yes	6		85			yes							457414	1422610							7/27/1956
151093	a151093		WILDER	GILLIS	Private		6		70			yes		COOPER	HAMILTON	SYCAMORE	39.235866	-84.417656	455890.3	1425376	59					SHALE	12/8/1956
179958	a179958	Log #179958(9)	FORMICA CORP.		Industry	yes	12	181	181			yes	10155	READING	HAMILTON	SYCAMORE	39.246251	-84.428841	459737.4	1422290.8	151	30		400	102	SAND	2/12/1957
179970	a179970	Well #8	CITY OF WYOMING		Municipal	yes	16		191	4379	southwest	yes			HAMILTON	SPRINGFIELD			454500.7	1412090.6				750	132		4/10/1961
179971	a179971	Well #7	CITY OF WYOMING		Municipal	yes	16		193	4488	southwest	yes			HAMILTON	SPRINGFIELD			454610.8	1411837.5				750	132		4/10/1961
201948	a201948	Log #201948(77)	International Minerals & Chemical Corp.		Industry	yes	12		156	684		yes		Big 4 and Smalley Road	HAMILTON	SYCAMORE			454615	1416917	142						3/28/1958
2025361	a2025361		LAGALY	LANCE	Geothermal	no			75			yes	73	HILL	HAMILTON	SPRINGFIELD	39.224941	-84.476317	452268.6	1408677.6						LIMESTONE & SHALE	10/11/2009
2033048	a2033048		SYSCO CINCINNATI		Industry		6	100	100			yes	10510	EVENDALE	HAMILTON	SYCAMORE	39.2583	-84.439517	464190	1419361.1	90	10	0.02			SAND	11/18/2010
230001	a230001		MAXWELL CO.		Industry	yes	6	163	163			yes		126	HAMILTON	SYCAMORE	39.255862	-84.439775	463303	1419271.3	149	15			50	SAND	1/1/1951
230008	a230008	Well #6	CITY OF WYOMING		Municipal	yes	16		193	5200	southwest	yes			HAMILTON	SPRINGFIELD	39.22818	-84.46607	453385	1411606.3	168			600	145	SAND	2/15/1960
2501	a2501		NEW YORK CENTRAL R.R						101			no		EVANDALE	HAMILTON	SYCAMORE	39.259017	-84.428034	464382.5	1422619.4					48	SAND	---
250803	a250803	Well #6	AMERICAN CYNAMID		Industry	yes	12	167	170			yes	10155	READING	HAMILTON	SYCAMORE	39.243472	-84.43204	458744.5	1421363.1	127	40		860	89	LIMESTONE	4/9/1960
250804	a250804	Log #250804(6)	AMERICAN CYNAMID		Industry	yes	12	176	178			yes	10155	READING	HAMILTON	SYCAMORE	39.243293	-84.431478	458675.6	1421520.2	141	35		840	85	LIMESTONE	4/17/1960
250805	a250805	Wyoming #9	CITY OF WYOMING		Test Well / Observation Well	no	6		194		southwest	yes		OAK	HAMILTON	SPRINGFIELD	39.231594	-84.465174	454621.1	1411888.3	194				130	GRAVEL/SAND /ROCK	4/24/1960
250806	a250806	Wyoming #10	CITY OF WYOMING		Test Well	no	6		192		southwest	yes		OAK	HAMILTON	SPRINGFIELD	39.231594	-84.465174	454621.1	1411888.3	194				130	GRAVEL/SAND /ROCK	5/9/1960
258873	a258873		VOIX	JOHN R	Private	yes	6		100			yes	1916	HUNT	HAMILTON	SYCAMORE	39.226534	-84.428259	452553.2	1422301.6	42			1		ROCK	6/25/1963
33682	a33682		KINSLER		Private	yes	8		141			yes		BENSON	HAMILTON	SYCAMORE	39.220197	-84.435224	450290.4	1420281		10			97	ROCK	3/14/1949
342965	a342965	Well #9	CITY OF WYOMING		Municipal	yes	16	160	187	5610	southwest	yes		WYOMING	HAMILTON	SPRINGFIELD	39.22745	-84.466381	453121.1	1411512.8	160			508	137	SAND	7/25/1966
342966	a342966	Well #9	CITY OF WYOMING		Municipal	yes	16	160	187	5610	southwest	yes		WYOMING	HAMILTON	SPRINGFIELD	39.22745	-84.466381	453121.1	1411512.8						GRAVEL & CLAY	7/25/1966
348924	a348924	Well #1A	CITY OF WYOMING		Municipal	yes	16		195	4790	southwest	yes							453469.9	1411986.1				900			12/6/1961
358264	a358264		MICRO MECHANICAL FIN		Industry	yes	8	150	185			yes		LOCKLAND	HAMILTON	SYCAMORE	39.26168	-84.434349	465389.4	1420851.1	150	31.75			77	SAND & GRAVEL	7/3/1969
358267	a358267	Log #358267(9)	FORMICA CORP.		Industry	yes	12	165	168			yes		42	HAMILTON	SYCAMORE	39.243221	-84.430929	458646.7	1421675.4	122	43		595	74	SAND & GRAVEL	1/31/1975
37453	a37453	Log #37453(47)	SAWBROOKS STEEL CAST		Industry	yes	8		154			yes		SHEPARD MEWHORTER	HAMILTON	SYCAMORE	39.229428	-84.448522	453732.4	1416586.5	154	21		250	110	LIMESTONE	8/10/1948
497764	a497764	Log #497764(47)	THE SAWBROOK STEEL		Industry	yes	12		174			yes		SHEPRED	HAMILTON	SYCAMORE	39.229428	-84.448522	453732.4	1416586.5	154	21.5		454	81	SHALE	10/17/1977
51743	a51743		VILLAGE OF GLENDALE		Municipal	yes	12		194			yes		SHARON	HAMILTON	SYCAMORE	39.268695	-84.427961	467906.9	1422714.5	164			773	66	SAND & GRAVEL	11/25/1953

GE Aviation - Evendale, Ohio

ODNR ID	ODNR ID (Text)	Alternate Well ID	Owner	Well Use	Pump Installed	Diameter (inches)	Screen Bottom (ft bgs)	Well Depth (ft bgs)	Approximate Distance from GE Property (ft)	Direction from GE Site	Well Log	House Number	Street Name	County	Township	Latitude	Longitude	Y_coord	X_Coord	Case Length	Screen Length	Slot Size	Test Rate	Static Water Level	Aquifer Type	Date Installed
58819	a58819	Log #553(48)	DARLING & COMPANY	Industry	yes	12		175			yes		BIG 4/SMILEY	HAMILTON	SYCAMORE	39.235728	-84.440293	455976.2	1418966.5				500	94	SAND & GRAVEL	---
819525	a819525	Well #10	CITY OF WYOMING	Municipal	yes	14	180	180	5474	southwest	yes							452710.8	1411882.4	135	45	0.04	609-805			6/12/1996
879108	a879108		SOUTHWESTERN OHIO WATER COMPANY	Industry	no	18	200	200			yes		MANGHAM	HAMILTON	SPRINGFIELD	39.24167	-84.4625	458275.1	1412724.2	130	70	0.03	1000	56.8	ROCK & GRAVEL	10/18/2001
922285	a922285		HARRISON CONCRETE	Industry	yes	8	170	170			yes	603	SHEPARD	HAMILTON	SYCAMORE	39.23566	-84.46043	456073.9	1413262.8	160	10	0.015	100	54	SAND	4/13/2001
94101	a94101		POLLAK STEEL CO.	Industry	yes	8		188			yes		EVENDALE	HAMILTON	SYCAMORE	39.255903	-84.435764	463293.2	1420406.8	173			350	60	SAND & GRAVEL	11/27/1951
94116	a94116		FORMICA CORP.	Industry	yes	12		195			yes	10155	READING	HAMILTON	SYCAMORE	39.24675	-84.434324	459952.7	1420743.1	177			400	91	SAND & GRAVEL	6/13/1952
94117	a94117		FORMICA CORP.	Industry	yes	12		190			yes	10155	READING	HAMILTON	SYCAMORE	39.247678	-84.434113	460290	1420809.8	172			400	91	SAND & GRAVEL	7/14/1952
9931134	a9931134	Log #207(17)	FOX PAPER CO	Industry	yes	18		181	3695		yes		LOCK/WYOMING AVE	HAMILTON	SPRINGFIELD	39.226874	-84.455726	452844.3	1414524.4				700	108	ROCK	11/11/1933
9931135	a9931135	Well #6	FOX PAPER CO	Industry	yes	10		175			yes			HAMILTON	SPRINGFIELD	39.224937	-84.456198	452144.5	1414376				250	131	SAND & GRAVEL	5/14/1947
9931136	a9931136	5	PHILLIP CAREY CO	Industry	yes	26		180			yes			HAMILTON	SPRINGFIELD	39.219203	-84.461072	450084.3	1412951.4				1400	100	BEDROCK	1/4/1932
9931137	a9931137	#2	GARDNER BOARD AND CA	Industry	yes	26		173			yes			HAMILTON	SPRINGFIELD	39.221118	-84.460767	450781.6	1413051.5		40		800	110	SAND & GRAVEL	5/20/1949
9931138	a9931138	Test Well #1 of 1934	THE GARDNER RICHARDS	Test Well	yes			174			yes		WILSON	HAMILTON	SPRINGFIELD	39.222576	-84.456294	451285.7	1414331.9					95	SHALE & SANDSTONE	8/27/1934
9931139	a9931139	Log 296(25)	FOX PAPER CO	Industry	yes	12		175			yes		LOCK/COOPER AVE	HAMILTON	SPRINGFIELD	39.225058	-84.455429	452183.4	1414595.1					76	ROCK	1/1/1925
9931143	a9931143	Log #400(36)	FOX PAPER CO.	Industry	yes			192			yes		EVENDALE	HAMILTON	SYCAMORE	39.259329	-84.436546	464547	1420210						SAND & GRAVEL	12/28/1945
9931159	a9931159	USGS 207-1	VILLAGE OF GLENDALE	Municipal	yes			181			yes		MOSTELLAR	HAMILTON	SYCAMORE	39.268139	-84.429001	467709.3	1422415.8	181					SAND	1/1/1934
9931160	a9931160	USGS 207-2	VILLAGE OF GLENDALE	Municipal	yes			160			yes			HAMILTON	SYCAMORE	39.268692	-84.428652	467907.4	1422519.1	160					SAND	---
9931161	a9931161		CITY OF READING					152			no		KOENIG PARK	HAMILTON	SYCAMORE	39.230212	-84.443944	453988.4	1417889.7					62	SAND & GRAVEL	---
9931176	a9931176	Log #9931176(77)	INT. MINERALS & CHEM	Industry	yes	12	156	156			yes			HAMILTON	SYCAMORE	39.235399	-84.439288	455850	1419247.1	38	14	0.03	300	100	SAND & GRAVEL	2/28/1958
9931384	a9931384	Log #36	PHILLIPS SWIMMING PO	Industry	yes			139			yes		ANN/HILLSIDE AVE	HAMILTON	SPRINGFIELD	39.227969	-84.453219	453229.5	1415243.9					74	SAND & GRAVEL	6/1/1937
9931385	a9931385	USGS 235	OHIO STATE HIGHWAY		yes			80			yes		GLENDALE-MILFORD	HAMILTON	SPRINGFIELD	39.258422	-84.467304	464403.8	1411497.9					52	SAND & GRAVEL	7/26/1938
9931387	a9931387	USGS 236	E.I. DUPONT DE NEMOU		yes			182			yes		WAYNE	HAMILTON	SPRINGFIELD	39.233443	-84.464909	455293.1	1411976.6				600	102	ROCK	1/1/1912
9931388	a9931388	USGS 237-4	VILLAGE OF WYOMING		yes			200			yes		VINE/WATER ST	HAMILTON	SPRINGFIELD	39.228689	-84.465329	453566.1	1411820						ROCK	1/1/1937
9931389	a9931389	USGS 242	PHILIP CAREY MANUFAC	Test Well	yes			186			yes			HAMILTON	SPRINGFIELD	39.220732	-84.462025	450647.2	1412694.4					130	BEDROCK	1/1/1942
9931411	a9931411	Layne #1	CITY OF WYOMING	Municipal	yes	10		192		southwest	yes			HAMILTON	SPRINGFIELD	39.22866	-84.465396	453555.6	1411799.9				710	119	SAND & GRAVEL	12/8/1940
9931413	a9931413	Layne #2	WYOMING WATER WORKS		yes	12		193			yes			HAMILTON	SPRINGFIELD	39.228663	-84.465272	453554.8	1411836.7				500	137	SAND & GRAVEL	9/6/1943
9931425	a9931425	USGS 227-2	WM S MERRELL CO					140			yes		AMITY	HAMILTON	SYCAMORE	39.214709	-84.443303	448340.5	1417949.4					15	LIMESTONE & SHALE	1/1/1936
9931426	a9931426	USGS 227-1	WM S MERRELL CO					142			yes			HAMILTON	SYCAMORE	39.213087	-84.444443	447757.6	1417613.8						LIMESTONE & SHALE	10/1/1936
9931427	a9931427	USGS 218-1	JOSLIN SCHMIDT CORP		yes			110			yes			HAMILTON	SYCAMORE	39.23634	-84.442646	456212.7	1418303						SAND & GRAVEL	1/1/1910
9931428	a9931428	USGS 218-2	JOSLIN SCHMIDT CORP		yes			150			yes			HAMILTON	SYCAMORE	39.236303	-84.442693	456198.4	1418291.4					65	SAND	1/1/1911
9931429	a9931429	USGS 218-3	JOSLIN SCHMIDT CORP		yes			162			yes			HAMILTON	SYCAMORE	39.236266	-84.442644	456187.1	1418305.3					37	ROCK	9/1/1933
9931431	a9931431	USGS 217	INTERNATIONAL AGRIC		yes			173			yes			HAMILTON	SYCAMORE	39.237046	-84.440428	456457.7	1418937.2					37	GRAVEL	1/1/1908
9931446	a9931446	USGS 2209	THE DRACKETT CO	Industry	yes			170			yes			HAMILTON	SYCAMORE	39.264977	-84.432305	466578.6	1421457.1				1000	25	SAND & GRAVEL	10/7/1933

Table A-2

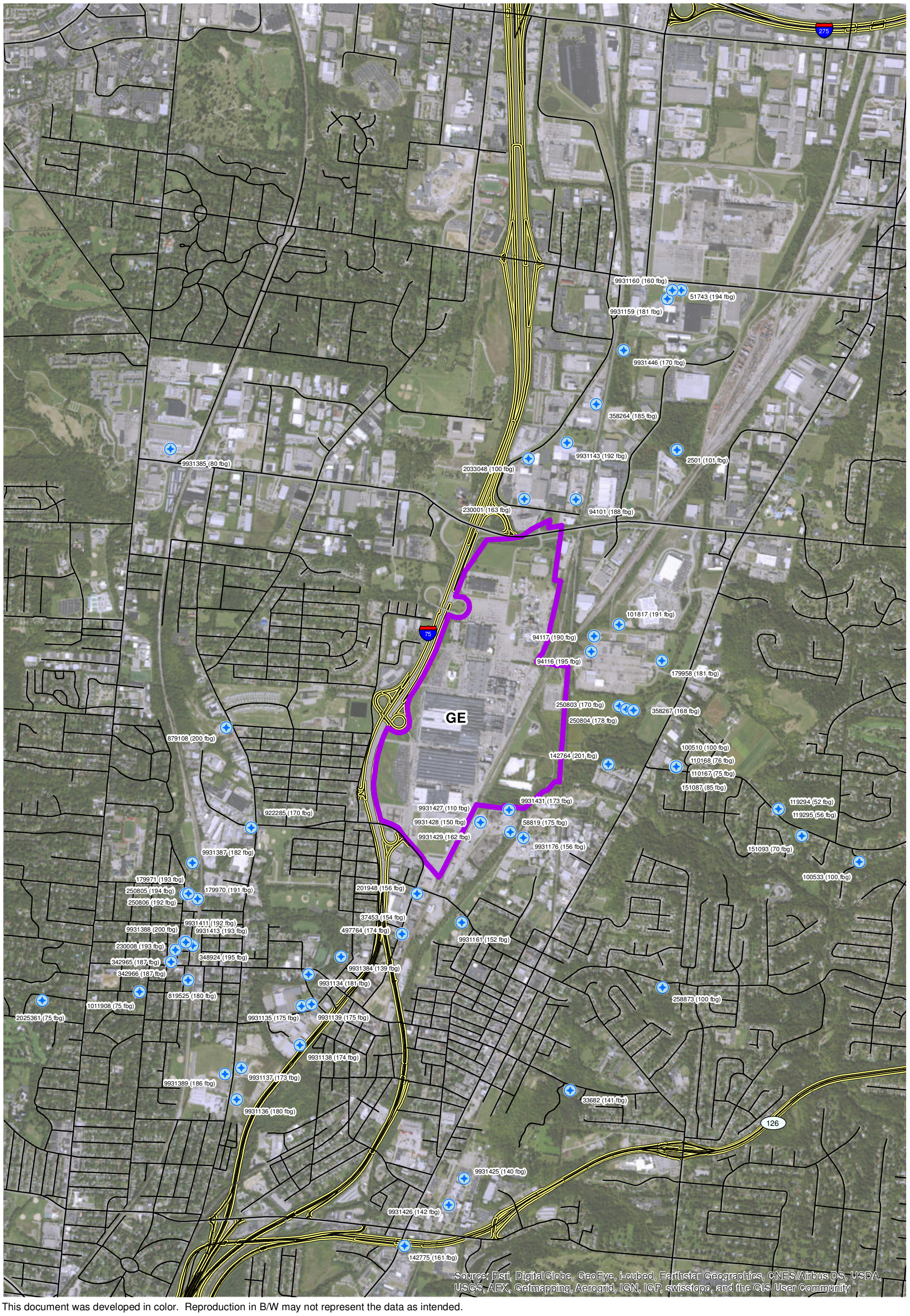
OHIO VAP - Urban Setting Designation (USD)

GE Aviation - Evendale, Ohio

THRESHOLD CRITERIA (OAC 3745-300-10(C))	
(1)	Located within the boundares of a city or township with a population of at least 20,000 residents
(2)	At least 90% of parcels within the city or urban township where property lies must be connected to a community water system
(3)	It cannot be located within an Ohio EPA-endorsed wellhead protection area or one submitted for endorsement
(4)	There can be no wells used for potable purposes located within one half mile and/or must show that there is no reasonable expectation that any potable water wells will be installed within one half mile.

SUMMARY: AREA SOUTH OF GE AVIATION FACILITY, EVENDALE, OHIO		
CRITERIA		**SUMMARY**
(1)	**U.S. Census 2010 Population Estimates**	Population of immediate area appears to be greater than 20,000; this meets Ohio EPA's Threshold Criteria.
a)	Village of Lockland: 3,449	
b)	City of Evendale: 2,767	
c)	City of Wyoming: 8,428	
d)	Village of Arlington Heights: 745	
e)	City of Reading: 10,385	
SUM:	**25, 774**	
(2)	**Sources of Water Supply**	Area immediately surrounding Facility appears to to have approximately 90% water supply provided by community source; this meets Ohio EPA's Threshold Criteria. *Further investigation would be required to determine actual percentages.*
a)	Village of Lockland: Lockland Village Water Department	
b)	City of Evendale: Greater Cincinnati Water Works	
c)	City of Wyoming: Wyoming Water Works (City of Cincinnati Water Supply provides emergency back-up)	
d)	Village of Arlington Heights: Greater Cincinnati Water Works	
e)	City of Reading: Greater Cincinnati Water Works	
(3)	**Wellhead Protection Areas**	The areas immediately to the west and southwest of the Facility are in conflict with the Wyoming Wellfield Protection Area; however, groundwater predominantly flows to the south, which is the primary area of focus in this investigation.
	Refer to Figure A-2 for map of Facility in relation to wellhead protection areas.	
	(Figure A-2 references Ohio EPA Figure: *Drinking Water Source Protection Areas and Public Water System Wells and Intakes, Hamilton County, Ohio;* September 24, 2009.)	
(4)	**Potable Water Wells**	Survey of a 1/2-mile radius from the border of Facility to the south does not show evidence of a potable water well within required distance; this meets Ohio EPA's Threshold Criteria.
	Refer to Figure A-3 for map of Facility in relation to water wells located in 1/2-mile vicinity.	
	Refer to Figure A-3 for table of well data available within 1/2-mile radius of Facility. (CAGIS, 2016.)	

Figures



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LEGEND

WATER WELL LOCATION
9931389 (186 fbg) (ODNR ID, WELL DEPTH)

SOURCE: OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF SOIL AND WATER RESOURCES

GE EVENDALE, OHIO

NEARBY WATER WELLS

0 1,500 3,000 6,000
Feet

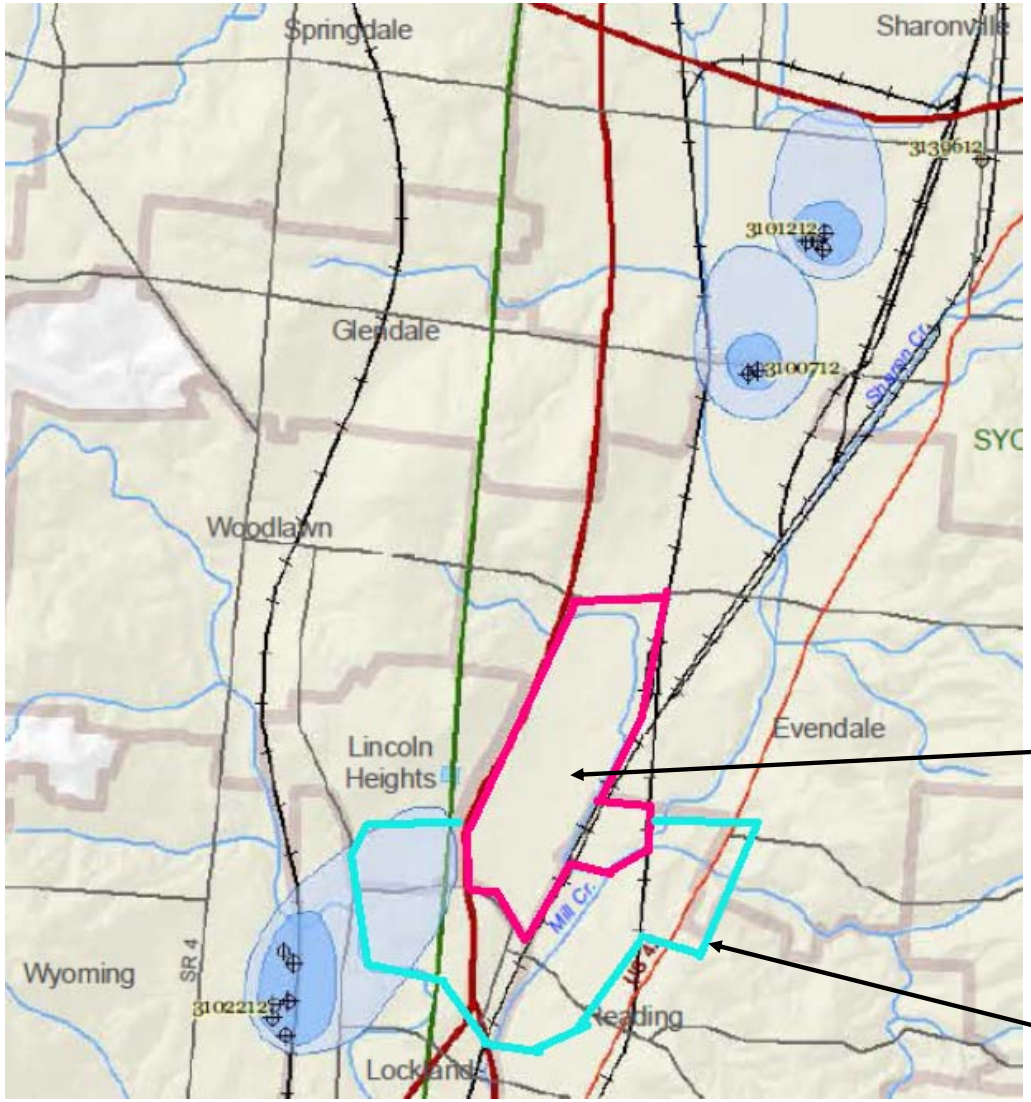
N

FIGURE A-1

FEBRUARY 2016
GE-CEP/STDS/001

O'BRIEN & GERE

Figure A-2



Public Water Systems in Hamilton County (PWSID and System Name)

3100712, GLENDALE VILLAGE PWS
3100812, HARRISON CITY PWS
3101112, INDIAN HILL CITY PWS
3101212, LOCKLAND VILLAGE PWS
3102212, WYOMING CITY PWS

Drinking Water Source Protection Areas

Protection Zone, System Type

Inner Zone, Community

Outer Zone, Community

GE Facility

N
W E
S

½ mile radius from site property border

Drinking Water Source Protection Areas, and Public Water System Wells and Intakes

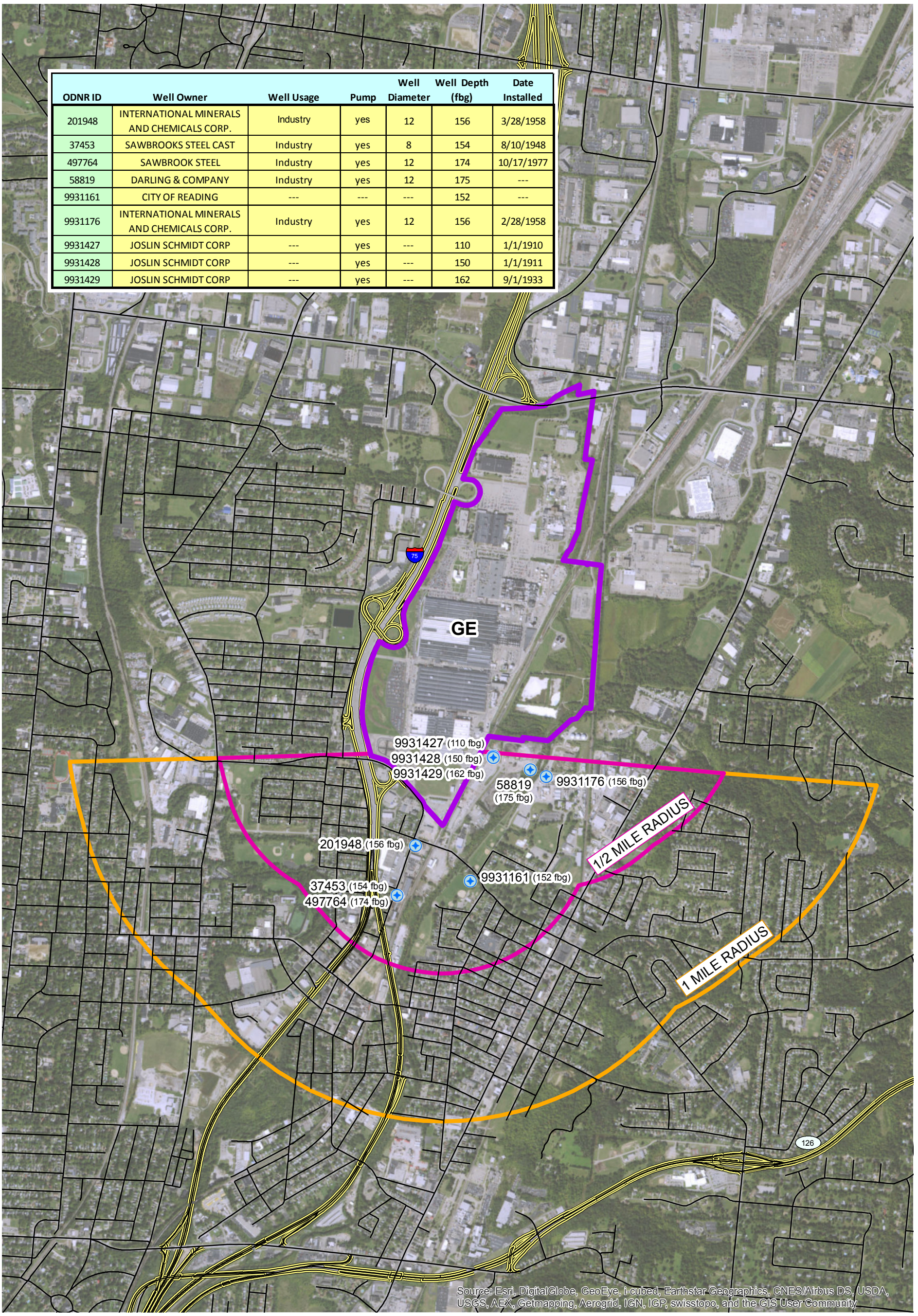
Hamilton County, Ohio

http://www.epa.state.oh.us/ddagw/swap.aspx

Date: September 24, 2009

OhioEPA
Division of Drinking and Ground Waters

ODNR ID	Well Owner	Well Usage	Pump	Well Diameter	Well Depth (fbg)	Date Installed
201948	INTERNATIONAL MINERALS AND CHEMICALS CORP.	Industry	yes	12	156	3/28/1958
37453	SAWBROOKS STEEL CAST	Industry	yes	8	154	8/10/1948
497764	SAWBROOK STEEL	Industry	yes	12	174	10/17/1977
58819	DARLING & COMPANY	Industry	yes	12	175	---
9931161	CITY OF READING	---	---	---	152	---
9931176	INTERNATIONAL MINERALS AND CHEMICALS CORP.	Industry	yes	12	156	2/28/1958
9931427	JOSLIN SCHMIDT CORP	---	yes	---	110	1/1/1910
9931428	JOSLIN SCHMIDT CORP	---	yes	---	150	1/1/1911
9931429	JOSLIN SCHMIDT CORP	---	yes	---	162	9/1/1933



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LEGEND

WATER WELL LOCATION
9931389 (186 fbg) (ODNR ID, WELL DEPTH)

SOURCE: OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF SOIL AND WATER RESOURCES

GE EVENDALE, OHIO

NEARBY SOUTH AREA WATER WELLS

0 1,500 3,000 6,000
Feet

N

FIGURE A-3

FEBRUARY 2016
GE-CEP/STDS/001

O'BRIEN & GERE